ELECTRICAL WORLD

OCTOBER 31, 1931

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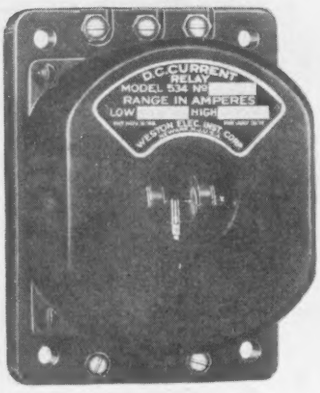

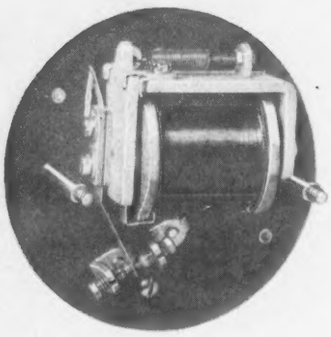

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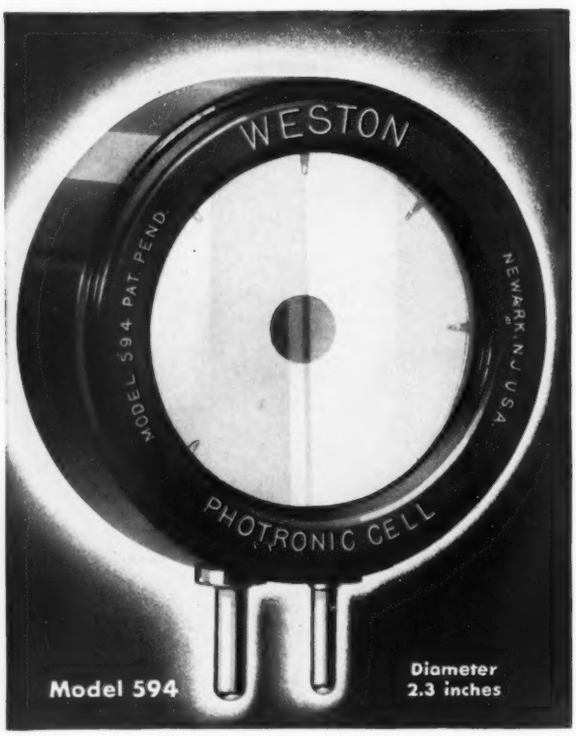

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ELECTRICAL WORLD

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for the Week Ending

October 31, 1931

New York wins St. Lawrence point

—**Hoover yields to state demand** that New York have a say in development plans for international project. Secretary of State Stimson invites Walsh of New York board to Washington for conference—*p. 762.*

—**System planning in lean days** requires an altered approach, and for these uncertain times load forecasting on population basis is seen as safer than that based on customer totals. A plan for system planning—*p. 778.*

The average level of illumination in the United States would be doubled by tonight if all lighting equipments were thoroughly washed today.

WARD HARRISON,
Director of Engineering,
National Lamp Works

What are the world-trade prospects?

—**With Britain at the cross-roads** as her currency wavers unsteadily in value and the gold standard in jeopardy throughout the world, what is the future for our foreign trade? H. Parker Willis sees hopeful signs—*p. 772.*

—**Flue-gas washers overseas** differ little from the more ambitious of American efforts, and where approximations of complete removal of foreign matter are attempted costs and complexities run high—*p. 783.*

—**Factors that affect welding** analyzed by research engineer. Investigation of causes of slag and gas holes shows non-metallic inclusions and excesses of deoxidizing material to constitute the major hazard—*p. 786.*

Commissioners defend state rights

—**Federal encroachment decried** by virtually every speaker at annual convention of railroad and utilities commissioners. Give state regulation a chance to prove itself is the theme of this meeting—*p. 762.*

—**Tap substation on 110-kv. line** combines reliability, economy and simplicity with minimum interruption hazard to the supply line. Expulsion fuses substituted for high-tension oil breakers—*p. 776.*

—**House-wiring adequacy basis** established by Association of Electragists, International, offers the industry a tangible standard for future installations and rewiring of old ones. Aid to sale of appliances foreseen—*p. 789.*

Electragists define wiring adequacy

Washington Agrees to Consult New York in St. Lawrence Negotiations

A CONFERENCE between Secretary of State Stimson and Frank P. Walsh, chairman of the New York State Power Authority, was held in Washington on Wednesday, October 28, over the part that should be accorded to that state in the pending negotiations between the United States and Canada over the canalization of the St. Lawrence and the incidental generation of power in great quantities on that river.

At the conference Mr. Walsh, who was accompanied by Delos M. Cosgrove, vice-chairman of the Power Authority, presented to Mr. Stimson a long memorandum containing a full statement of the state's case signed by all the trustees. Mr. Stimson, it is understood, expects the negotiations to proceed with a minimum of friction. He is said to believe that the issues between Washington and Albany are primarily legal and that the federal water-power act does not settle the whole question as to the extent to which the federal government may control power developed from waterways or the limits imposed upon the owner of riparian rights. Because of the importance attached to the St. Lawrence development, he does not intend to delay the negotiations with Canada, at least in so far as navigation questions are involved, until the New York State situation has been fully cleared up.

Holding of this conference followed the insistence of Mr. Walsh, supported by Governor Roosevelt, that direct consultation with New York must accompany the negotiations. Mr. Walsh's letter to the President of October 3 (quoted from in the ELECTRICAL WORLD of October 17, page 674) was followed by another one, dated October 17, in which he said:

> Since our last letter to you statements have appeared in the Canadian press quoting Premier Henry to the effect that the Dominion of Canada and the Province of Ontario have reached a "complete understanding" regarding the respective rights of the province and the Dominion relative to the power development of the international section of the St. Lawrence River, as a result of conferences on several occasions between Premier Bennett of the Dominion government and Premier Henry of the government of Ontario.
>
> It would appear, therefore, that the federal and provincial governments of Canada have reached a complete accord regarding issues corresponding with those upon which the Power Authority, representing the State of New York, feels it essential to seek an understanding with you.
>
> If, on the other hand, the State of New York is denied the opportunity to reach such an accord with the national government, precedent to negotiations with Canada, we respectfully submit there is grave danger of conflict and confusion which might seriously impede the accomplishment of the project, if not entirely thwart the will of the people of New York as expressed by the Legislature.

To this President Hoover replied pointing out that the negotiations with Canada would be conducted by the Department of State. A few days later Secretary Stimson asked Mr. Walsh to meet him, and this week's conference followed.

▼

Court Hears Argument Over G. O. Smith's Seat

WHETHER OR NOT George Otis Smith is rightfully chairman of the Federal Power Commission was argued on October 27 before the Supreme Court of the District of Columbia, eminent counsel appearing on both sides. An early decision was promised by the court, but the constitutional question involved is sure to be carried to the United States Supreme Court.

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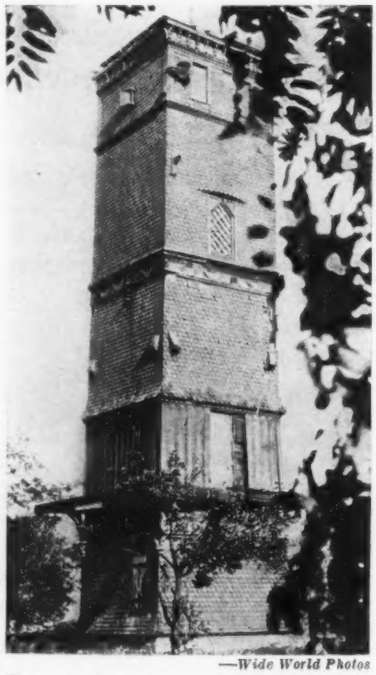
EARLY WIND-POWER PLANT



—*Wide World Photos*

Recent plans to generate electricity by wind power in New Jersey lend interest to this 60-ft., 40-ton tower erected at Cleveland in 1888 by Charles F. Brush of arc-light fame, with 1,800 sq.ft. of sail surface. It still stands, and Ford may buy it.

▼

Commissioners Agree and Disagree at Richmond

CO-OPERATION WITH the various regulation agencies of the federal government was a prominent topic of discussion at the annual convention of the National Association of Railroad and Utilities Commissioners at Richmond, Va., October 20-23. It was coupled, however, with a more than ever vigorous stand against the encroachment of federal authority into the province of state rights in regulating internal utility operations. The co-operative attitude was reflected in the participation with the Interstate Commerce Commission of a delegation of the state commissioners who sat in the hearings on the railroads' appeal for a horizontal increase in freight rates. Resentment against the further intrusion of federal agencies into local regulation was focused on the same commission's ruling sanctioning the abandonment of a Long Island Railroad branch in the face of strenuous opposition from the New York Transit Commission.

The vigor of the opposition to interference with the state's exercise of its police powers by national regulatory boards was epitomized in addresses by Commissioner Frank P. Morgan of Alabama and former Commissioner James S. Benn of Pennsylvania. The former said, "We need regional federal power commissions about as much as Switzerland needs a navy." Mr. Benn insisted that "government ownership is the real objective of many of the most voluble critics of existing regulatory laws and of many of the proponents of increased federal jurisdiction."

Within the field of the electrical engineer the most significant topics on the program were the question of depreciation of telephone plant and the propriety of optional electric rates. The Interstate Commerce Commission has ruled that depreciation rates for telephone facilities shall be based upon estimated service values and service lines developed by a study of the company's history and experience and by means of engineering and other information. The association of commissioners was advised by its committee on telephone depreciation that the fixing of depreciation rates solely on a study of property already retired is decidedly improper because the retired elements have been affected by growth and inadequacy.

The committee on utility rates went on record as follows about the domestic electric customer:

"Today it is doubtful whether any

LATEST VIEW OF THE SAFE HARBOR HYDRO PROJECT ON THE SUSQUEHANNA RIVER

Electrification of the Pennsylvania Railroad will be facilitated by the early completion of this thirty-million-dollar plant, with an initial capacity of 255,000 hp. and an ultimate rating of 510,000 hp. It will belong to the Aldred group of properties in Pennsylvania and Maryland.

▼ ▼ ▼

customer of an electric utility—street lighting excepted—furnishes the utility with a better load factor than a domestic customer using electricity for lighting, refrigeration, cooking and water heating. This better load factor, taken with the increased use of the facilities without a corresponding increase in cost to the utility, justifies a promotional rate curving sharply downward to meet the needs and secure the business from this class of domestic customers."

Having subscribed to the inducement form of rate, the committee also advocated the provision of options in rates to effect the transition from the existing domestic schedule to the promotional form. At this point Commissioner Maltbie of New York dissented. New York regulatory practice views the optional rate as a form of discrimination inasmuch as two customers who exercise different choices may subsequently pay different sums for the same amount and kind of service. The New York commissioner also dissented from the report of the committee on uniform classification of accounts on the ground that the costs in items of depreciation, retirement and purchase of working plant are not now required in sufficient detail to give much assistance in cost allocations for rate purposes.

Advocacy by Claude L. Seavey, president of the California Railroad Commission, of legislation by Congress to limit the powers of federal courts in upsetting rates fixed by state commissions was noted last week (page 718).

Commissioner J. J. Murphy of South Dakota was elected president, Hugh Williams of New Mexico was advanced to the first vice-presidency, and J. Paul Kuhn of the Illinois Commerce Commission was chosen as the second vice-president.

For Rate Investigation of Indianapolis Company

FOLLOWING THE FILING of a mandamus suit by Ward B. Hiner seeking to compel the Indiana Public Service Commission to make an investigation of the rates of the Indianapolis Power & Light Company and to fix a new schedule, Chairman John W. McCardle of the commission announced last week that it would order an audit and appraisal as soon as a petition requesting a rate investigation was filed. The law makes such action optional, not mandatory, with the commission.

Mr. McCardle has informed the Corporation Counsel of Indianapolis that the commission will be pleased to have the city appoint a certified public accountant to participate in the audit.

▼

Doherty Matters Interest Missouri and Kansas

RELATIONSHIP between the St. Joseph Railway, Light, Heat & Power Company and the Buchanan County Transmission Company, both controlled by Henry L. Doherty through the Cities Service Company, is before the Missouri Public Service Commission in an effort to determine whether the Buchanan company is operating in the state as a public utility. The representatives of the other St. Joseph company insist that it is not, but serves only that company with energy generated at Topeka, Kan.

A hearing in the Shawnee County Court at Topeka last week concerned the endeavor of Kansas authorities to prohibit the sale in that commonwealth of Cities Service Company securities in alleged contravention of the state law requiring a permit from the "blue sky" department. Attorneys for the Gas Service Company, the utility most directly concerned, contended that the Cities Service was not doing any business directly in Kansas, that it did not directly own any Kansas properties and therefore that it did not come under the jurisdiction of the "blue sky" commissioner.

▼

Ceremony Marks Transfer of Electrical Institute

FORMAL TRANSFER of the exhibit in Grand Central Palace, New York, heretofore controlled by the Westinghouse Lighting Institute to the Electrical Association of New York was made in a brief ceremony on Wednesday, October 28. Arthur E. Allen, vice-president Westinghouse Lamp Company, said that the new arrangement opens broader means for extending the use of electricity. Walter Cary, president Westinghouse Lamp Company, said that the institute had never been commercialized. Its scope embraced an industry, not a single company.

Clarence Law, accepting the gift as president of the Electrical Association of New York, read a resolution recognizing the local, national and international reputation that had been established and pledging the association to carry on the activities. Somewhat enlarged in scope to take in other household uses, the institution will hereafter be known as the Electrical Institute.

An impressive tribute, in light, in honor of Edison followed the addresses.

Missouri Shows A.I.E.E. Many Things of Interest

FOUR HUNDRED AND TEN men, including 173 students, registered for the Southwest District meeting of the American Institute of Electrical Engineers held at Kansas City last week from Thursday to Saturday. Transmission and distribution, communication and other topics filled the main technical sessions, and papers on a wide variety of subjects were prepared by the students for the meetings where they furnished the program. At the opening session President Charles E. Skinner, Secretary F. L. Hutchinson and Vice-President George C. Shaad of the Institute were heard from. Joseph F. Porter and William Hand, Edison Pioneers of Kansas City, spoke briefly of the passing of the great inventor, after which a silent tribute was paid to him.

Much interest was aroused by the Thursday evening session held in Thomas A. Edison Hall and devoted to the St. Louis-Bagnell interconnection. The paper of E. L. Hough and V. L. Nelson on the interconnection of the 25-cycle and 60-cycle systems of the Union Electric Light & Power Company and a related paper by E. K. Shively and G. S. Whitlow described the selection and operation of the two 26,800-kva. variable-ratio synchronous-induction frequency changers recently installed by the St. Louis company to interconnect the St. Louis, Keokuk and Bagnell systems. The discussion was livened by arguments pro and con from the respective adherents of the synchronous-induction and synchronous-synchronous types of machines. This session was concluded by the showing of a most interesting sound picture (not yet publicly released) of the Ozarks development.

P. N. Vinther, Dallas Power & Light Company, discussed the advantages, disadvantages and general results of electric welding as applied to the erection of the nineteen-story office building of his company. He predicted that the use of electric welding in the construction of buldings would increase rapidly. Prof. C. T. Almquist of the University of Oklahoma described the calculation of load division in distribution system networks, using a step-by-step and superposition method. A paper by D. C. Jackson, Jr., and R. W. Warner gave an analysis of lightning disturbances on the high-voltage lines of the Kansas City Power & Light Company, the results of which seemed to indicate that there was little correlation between ground contour and such troubles.

Among other papers read at the well-attended sessions were one on the effect of wave form on the operation of induction-type relays, by P. H. Robinson, which indicated how wave form affects relay accuracy in complicated and extensive systems; one by C. H. Frier on the telegraphic pilot-wire relay system, which described a system developed by the Oklahoma Gas & Electric Company to protect its long lines, and one by J. Slepian and L. R. Ludwig, treating intensively the subject of backfires in mercury-arc rectifiers. Good discussions were elicited at the closing session on Saturday by papers on the application of primary distribution fuses, by F. E. Sanford; the expulsion fuse, by J. Slepian and C. N. Denault, and fuse cutouts for alternating-current distribution circuits, by E. G. Newton.

James N. Holsen's treatise on "Forecasting Population for Engineering Purposes" was one of the "high lights" of the communication session.

The Kansas City Section was host at a banquet on Friday evening with George Fiske as chairman. Inspection trips included one to the Bagnell plant and one to the rebuilt plant of the Kansas City Power & Light Company at Second and Grand Avenue.

George Mills of the Central & Southwest Utilities Company of Dallas was nominated as vice-president for the Southwest District to succeed Dean Shaad of Kansas University. The 1933 meeting of the district is to be held in St. Louis.

▼

South Carolina Has First "No Fuse" Town

RIDGEVILLE, S. C., claims the distinction of being the first town in which the distribution of electrical energy to domestic users does not involve the use of fuses in the household wiring circuits. These are protected, instead, by small circuit breakers.

This unusual distribution system is a result of the South Carolina Power Company's efforts to build a larger rural load without incurring a correspondingly larger, or possibly even a proportionately greater, increase in the cost of operation. Two years ago, to prevent a wide growth in isolated rural areas of a type of house wiring that would be a source of continual demand on the power company for assistance in replacing blown fuses, the company instituted a regulation providing that in all towns of fewer than 1,000 inhabitants domestic breakers, instead of fuses, be installed in all new house wiring and in all alterations or additions to existing circuits.

In this way the expense of maintaining service stations available to all parts of large rural districts is obviated. Only two calls from Ridgeville for assistance have been received in more than a year, customers being able to re-establish interrupted service themselves in nearly all cases.

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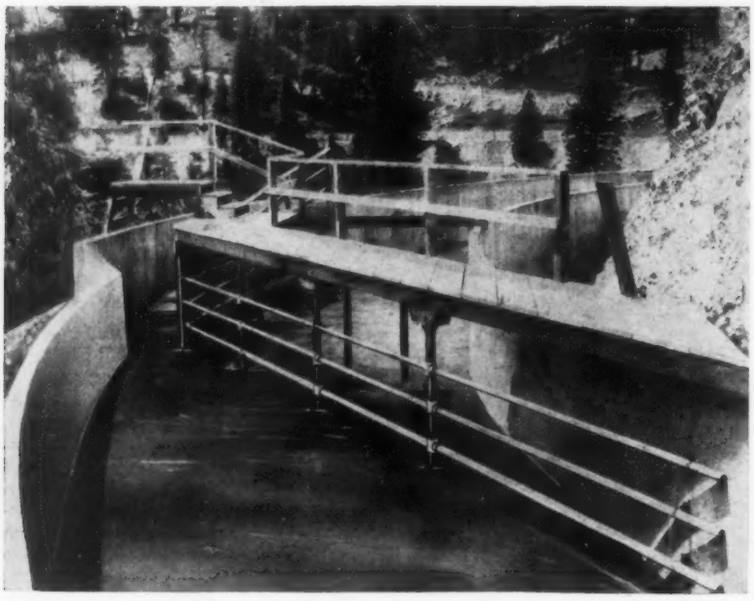
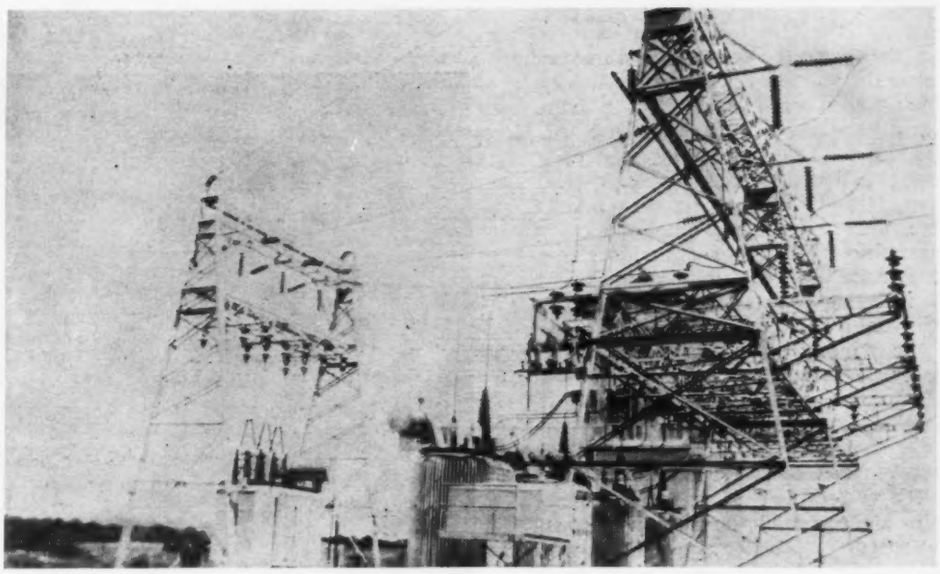
GUIDING HYDRO-BEWILDERED WILD ANIMALS TO SAFETY



This is one of two escapes for deer built in the Salt Springs-Tiger Creek conduit of the Pacific Gas & Electric Company's hydro-electric development on the Mokelumne River. There are two places at which an animal in the flume has no choice but to get out. At these points the conduit widens from 14 ft. to 19 ft. and a ramp is constructed at one side.

ONE OF TEXAS' NEW SUBSTATIONS

Hard times or no hard times, electric light and power companies continue to dot the nation's countryside with transmission-line substations. Here is a view taken by an ELECTRICAL WORLD *correspondent of a recent addition to the Dallas Power & Light Company's Payne substation, near Sherman, Tex., necessitated by an increase in transmission voltage.*



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Wisconsin Board Modifies National Accounting Plan

ELECTRIC UTILITIES have been requested to send representatives to a hearing before the Wisconsin Public Service Commission to study a proposed revison of the uniform classification of accounts prescribed for electric utilities having gross operating revenues in excess of $250,000 a year. This hearing is to be held at Madison on November 2, 3 and 4, and new rules are to be made effective on January 1.

The classification now in effect, it is stated in a memorandum by Commissioner David E. Lilienthal, was adopted by the commission in 1922 and is substantially identical with the accounting classification for electric utilities recommended by the National Association of Railroad and Utilities Commissioners and adopted in a large number of states. Commissioner Lilienthal says that the commission is dissatisfied with the existing classification of accounts. "The key to genuinely effective and expeditious regulation," the memorandum states, "is a classification of accounts which adequately reveals all the essential facts upon which regulation must be based. Judged by this test, we reached the conclusion some months ago that the existing classification falls short in a number of essentials."

The commission therefore directed its chief accountant, John H. Bickley, to prepare the draft of a new classification, which has been considered by a committee of the Wisconsin Utilities Association, certain changes being made. "The proposed new classification," the memorandum says, "contemplates that if an electric utility is engaged in rendering one or more other utility services, it shall keep for all of its utility services the same classification of balance sheet, income surplus, general fixed capital, undistributed and overhead construction cost, and general administrative expense accounts for all departments, and the instructions and definitions pertaining to each of these groups of accounts as prescribed for the electric department are to apply to all classes of utility services."

▼

Maltbie Defends New York Negotiated Electric Rates

STILL ANOTHER HEARING on the rate situation in New York City was held last week, and Dr. John Bauer, rate expert, availed himself of the opportunity to express his belief that the electric light and power companies could effect a saving of more than $30,000,000 a year for consumers, instead of the $5,500,000 estimated under the present schedules, and still make a fair return on their invested capital. The New York Edison Company and the United Electric Light & Power Company, he said, earned about $14,309,000 in excess of a 7 per cent return in 1930.

Bainbridge Colby, former United States Secretary of State, appearing for the Washington Heights Taxpayers' Association, said that the Edison rates represented a compromise with the companies and should be superseded by a revised schedule after a complete investigation. "We are anxious to see the Public Service Commission vindicated," said Mr. Colby. "We are unwilling to accept anything that looks like a rule-of-thumb compromise. We think a scientific determination of this great question should be reached."

Chairman Milo R. Maltbie defended the commission's procedure in fixing the rates now in force, declaring that the so-called compromise was for the benefit of the great majority of consumers of electricity. "It would be a wonderful thing for the lawyers and the experts, but a terrible thing for the people of New York," he declared, commenting on the proposal to institute a new rate case. Adoption of a non-compromise policy, he said, would result in the abandonment of pending negotiations with other utility companies and the substitution of long and costly litigation.

Mayor Walker was expected to sign on Thursday a formal complaint by the city to the commission against the present electric light and energy rates of the four companies of the Edison system. The complaint, drawn by Corporation Counsel Hilly, asks for a revision of the entire schedule approved by the commission in June.

▼

Cornell Celebrates Making of First Generator in U. S.

AT ITHACA, N. Y., on October 17 the Cornell Society of Engineers presented to Prof. George S. Moler a memorial commemorating the building of the first direct-current generator in America, This machine was built in 1875 by Prof. W. A. Anthony and Professor Moler to operate arc lights.

The memorial was presented by E. L. Philips, and Professor Moler then demonstrated the original generator and told of its building. He said the original desire to build the machine arose because only Grove cells were available to operate the arc light possessed by the physics department. A general description of a Gramme generator was published in a foreign periodical, and this

suggested the idea that a generator be built to operate the arc light. Its makers wound the coils and armature with wire which had been insulated on a lathe with a muslin warp. Square wire was used on the field coils, and eight coils were placed upon each of the four field poles. On the armature two windings were placed, insulated from each other and each connected to commutators that were made by slotting rubber sleeves and inserting copper bars in the slots.

Several successive changes were made in the windings and commutator, but the original machine was operated in 1875 to run an arc lamp, and later it operated other lamps.

The generator was exhibited at the Philadelphia Exposition in 1876 and was then operated for 40 years as a generator and motor on the Cornell campus. The speed was 1,000 r.p.m., and it was designed for six arc lamps with separate field excitation. At the time the generator was built, Professor Moler said, there were no ammeters or voltmeters available and no insulated wire of any size. Everything was new, and a cut-and-try method was essential to the development of a commercial machine.

Other speakers were President Farrand of Cornell, Bancroft Gherardi, Dexter S. Kimball and A. W. Smith. Mr. Gherardi presided and was introduced by John W. Ripley.

▼

Fairbanks-Morse Contract Upheld in California

WHAT IS CLAIMED by the proponents of municipal ownership as an important victory is the recent decision of the Appellate Court of California upholding the ruling of the Superior Court of Santa Cruz that the local City Council was within its constitutional rights in making a contract for the purchase of equipment to generate electrical energy. The case will be carried to the State Supreme Court.

Santa Cruz pumps its domestic water supply from the gravels of the San Lorenzo River, and, because it considered the rate it was paying to the Coast Counties Gas & Electric Company for electric pumping excessive, the City Council decided to enter into a contract with Fairbanks, Morse & Company under the terms of which Fairbanks-Morse agreed to take payment from the earnings of the water system. No bonds were issued nor was the indebtedness of the city increased in any way for the purpose. Five citizens of the community brought suit against the city and Fairbanks-Morse on the ground that the city had not the right to sponsor such a project without the vote of the people.

TWO COMPANIES UNITE TO LIGHT HUDSON BRIDGE

—*Wide World Photos*

Officially opened on October 24, the mighty George Washington Bridge from upper New York City to Fort Lee, N. J., is lighted by 230 500-watt lamps 90 ft. apart and staggered. The Public Service Electric & Gas Company of New Jersey and the United Electric Light & Power Company of New York will each supply half of the required energy.

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Pacific Coast Men Are Strong for Merchandising

MEN FROM ALL PARTS of California—contractors, wholesalers, manufacturers and central-station commercial men—gathered at Los Angeles recently for a "conclave" of the Commercial Section of the Pacific Coast Electrical Association. R. E. Fisher, vice-president of the association and vice-president in charge of public relations and sales, Pacific Gas & Electric Company, enunciated emphatically the principle that the light and power companies must never relinquish the right to sell and pioneer merchandise which will build load and serve the public. He advocated closer relations with dealers, discounts to employees on appliances and constant contact with existing consumers.

LeRoy M. Edwards, general counsel Southern Counties Gas Company, reviewed the case for public utility merchandising as he had prepared and presented it to a committee of the California Legislature at the time the Senate bill seeking to prohibit utility merchandising was under consideration. His contention was that merchandising was in the interest of the public and the dealers alike and was vital to the utility business.

At a round-table session Leo Gianini, Edison Lamp Works, San Francisco, made a good talk on lighting opportunities; R. C. McFadden, Southern California Edison Company, discussed oportunities for power development, and H. H. Courtright, Valley Electrical Supply Company, Fresno, told about merchandising opportunities.

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Scattered Happenings in the Electrical Sphere

UNITED STATES

No Injunction Against Cleveland Vote

The court injunction granted at Cleveland a short time ago to prevent voting next week on a light-plant bond issue for $2,500,000 has been dissolved by the Court of Appeals, which finds that councilmanic action in placing the proposal on the ballot was legal.

Mississippi, the Shoals and Regulation

Declaring that Mississippi is equally interested with Alabama and Tennessee in the Muscle Shoals power project, Governor Bilbo asked legislative authorization to appoint a Mississippi commission to sit with those of the two other states. The commission would be charged to investigate especially the policy of government ownership, operation and transmission. The bill advocated by the Governor for a public utilities commission, to be appointed by him, was unfavorably reported on by the judiciary committee.

Janesville-Fond du Lac Line Nearly Ready

One circuit of the Wisconsin Power & Light Company's 132-kv., 108-mile transmission line from Janesville to Fond du Lac is nearing completion. Of the 675 steel towers, 650 have been erected, and 48 miles of conductor have been placed. Work has been completed on the 132/66-kv. substation at Fond du Lac, and an addition to the Janesville 132-kv. substation has been made.

South Carolina Hydro Suit Settled

The United States Supreme Court has dismissed an appeal filed by the Twin City Power Company of South Carolina to restrain the Savannah River Electric Company from condemning its lands for the purpose of constructing a hydro-electric plant. An injunction in the case was refused by the Supreme Court of South Carolina. The Savannah River Electric Company obtained a license from the Federal Power Commission in 1928 for the construction of a dam and power plant on the Savannah River. The Twin City Power Company does not possess one.

Utility Inquiry Committee for Vermont

Governor Stanley C. Wilson of Vermont has named a special committee to investigate the subject of taxation of public utility companies. The commission was authorized by the last Legislature and will report to the Governor before November 7, 1932.

California Edison Rejects Tulare Offer

Several offers by the city of Tulare, Calif., to purchase the Southern California Edison Company's distribution system in that city have been rejected by the company, which announced that the Tulare system was not for sale. The last one offered $120,000 for the system, based on the city's appraisal of $112,000 and a bonus of $8,000. Condemnation proceedings by Tulare are now talked of.

Utility Outbids Municipal Plant

Public ownership forces of Nebraska, which won a victory at the last general election when the voters approved an initiated law permitting cities owning municipal lighting plants to extend their lines at will, received a setback recently, the Southern Nebraska Power Company having outbid the city of Hastings in the purchase of properties including transmission lines at the nearby towns of Ayr, Roseland and Holstein, now getting energy at wholesale from the municipal plant at Hastings. The city offered $12,500 for the properties and agreed to a top rate of 8 cents, while the company bid $15,300 with a top rate of 7.5 cents.

Little Rock's Sale of Plant Unsettled

While Burke Smith of Little Rock, Ark., is appealing to the State Supreme Court to order the city authorities to deliver to him the machinery of the old municipal generating plant, for which he agreed to pay $10,500, another judge has decided that the action of the City Council, which ordered the sale of the plant over the Mayor's veto, is subject to a referendum vote. The Supreme Court will hear the case on November 23. Little Rock now buys its power from the Arkansas Power & Light Company.

Rate Reductions in Central Missouri

Tentative permission from the Missouri State Public Service Commission has been given to the Missouri Power & Light Company to reduce its rates in virtually all the places it serves. The proposed cut will save customers $100,000 a year. The first reductions, effective in February, will apply to the larger cities such as Boonville, Brookfield, Clinton, Excelsior Springs, Kirksville, Mexico and Moberly. It will be 1 cent per kilowatt-hour in the top step for residential and commercial schedules, making the maximum charge 8 cents, the rate now prevailing in Jefferson City.

Oregon Hydro Site News

Action of the Oregon Hydro-Electric Commission and the Federal Power Board is awaited by the California-Oregon Power Company before proceeding with the development of projects along the Klamath River which will involve expenditures of about $20,000,000. The utility owns 1,200 acres of land along the river which is to be used for power sites and reservoirs. The first unit planned will cost about $4,000,000 and require between 18 and 24 months for completion. The Equitable Securities Company of San Francisco has notified the Oregon Hydro-Electric Commission that power applications filed by the company affecting the Zigzag and Salmon Rivers are withdrawn, and the commission has ordered the indefinite postponement of hearings.

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Coming Meetings

Great Lakes Division, N.E.L.A.—Engineering Section, Purdue University, Lafayette, Ind. Nov. 4-6. T. C. Polk, 20 N. Polk, 20 N. Wacker Drive, Chicago.

National Electrical Wholesalers' Association—Starrett's Netherland Plaza, Cincinnati, Nov. 9-13. E. Donald Tolles, 165 Broadway, New York.

Wisconsin Utilities Association—Electric Section, Hotel Pfister, Milwaukee, Nov. 12-13. J. N. Cadby, 135 W. Wells St., Milwaukee.

North Central Electric Association—Accounting Section, St. Paul Hotel, St. Paul, Nov. 13 and 14. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

International Conference on Bituminous Coal — Pittsburgh, Nov. 16-21. T. R. Alexander, Carnegie Institute of Technology, Pittsburgh.

American Society of Mechanical Engineers—New York, Nov. 30-Dec. 4. C. W. Rice, 29 W. 39th St., New York.

Receivers for Two Utility Companies

Receivers have been appointed for the Empire Public Service Corporation, upon petition of its controlling company, the Empire Corporation, and for the Electric Public Utilities Company. These companies, with headquarters in Philadelphia, controlled a number of small light and power companies in Virginia and North Carolina.

Getting Rid of the Ice Plants

J. F. Owens, president Oklahoma Gas & Electric Company, has announced the sale of all ice plants owned by that company to the Ice Service Company of Ardmore, Okla. "The ice plants were acquired incidentally as part of electric lines and plants purchased several years ago," Mr. Owens said. "With the sale of all of our gas-distributing properties in 1927 and now having disposed of all ice plants, our energies can be wholly directed to our primary function, the generation and distribution of electricity."

Frequency Differences Block Contract

Negotiations looking to a contract involving about $1,000,000 a year, under which the Northern States Power Company would supply power to the Twin City Rapid Transit Company for operating street cars in Minneapolis and St. Paul, have been abandoned for the present, it is announced by the presidents of the two utilities, on account of the expense involved in overcoming the difference in frequency, the transit company employing 35 cycles and the Northern States company 60 cycles. The Twin City Rapid Transit Company produces its own power at a hydro-electric plant at the Falls of St. Anthony and at steam plants in Minneapolis and St. Paul.

Expansion in St. Lawrence District

The St. Lawrence Counties Utilities, Potsdam, N. Y., recently raised the voltage of its line between Higley Falls and Massena from 88,000 to 110,000, thus providing two 110-kv. lines down state from its Massena plant. The work included an automatic switching station at Colton, and other changes and additions are under way.

ABROAD

British Plan Power Station Chain

Electric generating stations of the northeastern section of England, from Berwick-on-Tweed to Filey in Yorkshire, are to be linked together at a cost of approximately $6,000,000, according to a report from Consul William F. Doty at Newcastle-on-Tyne, made public by the Department of Commerce. The first stations to be connected will be the large generating plants at Dunston-on-Tyne, Carville, Sunderland, North Tees and Darlington. It is also planned to complete within a year a new power station at Dunston-on-Tyne to cost $8,500,000.

Stone & Webster Engineering Corporation

Bagnell is on the line

On October 19 the Bagnell development of the Union Electric Light & Power Company was placed in commercial operation. This project, on the Osage River near Bagnell, Mo., involves a concrete dam 2,543 ft. long and 148 ft. high, forming what is said to be the fourth largest artificial lake in the country. Six main and two station service units comprise the initial installation. Main units are of 27,500 kw. each. (See also "Electrical World," page 1212, June 27, 1931.)

EDITORIALS

L.W.W.MORROW
Editor

Commissions as defenders of state rights

IT IS a little unfortunate that the realm of electric power service should be saddled with problems that are more properly the concern of the whole body politic. But it happens that such problems as the heaviness of tax burdens to support expensive government and the preservation of state rights against complete usurpation by the federal government have almost their only forum for discussion in the field of the utility and its regulation. Consequently the public utility commissions stand out prominently as almost the last bulwark against the total alienation of the police powers of responsible local government to the federal bureaucracy.

Anomalous in the extreme is the spectacle of certain governors advocating federal regulation, governmental competition and government ownership of utility services. These sovereigns of what our forefathers intended to be sovereign states comfortably allied in a voluntary national union for defense and economic progress are literally abdicating away their powers to a grasping federal government. Little do they seem to realize that they are contributing as much as anyone to the complete abandonment of the sagacious program of our Revolutionary statesmen. Or can it be that their aspirations to be senators or better tend to obscure their present allegiance to the states which they have sworn to serve?

In the face of this sinister drift to federal centralization the state regulatory bodies come to the front as the last-ditch defenders of the inherently superior rights of the states. This is both commendable and unfortunate. It is commendable because hardly anyone else seems to sense the danger and the need of combating it. It is unfortunate because commissions, themselves subjected to scrutiny since the difficult experiment of regulation has not yet led to universal acceptance of the institution, thus open themselves to the insinuation that they are looking primarily to the security of their own tenure of office. It is doubly unfortunate that the utilities should find it incumbent upon them to align themselves with the commissioners in fighting this drift from democracy to autocracy.

It is to be hoped that before long the citizens will awaken to the risks involved in still further removing the accessibility of government and to the hazards of loading themselves with taxation to the breaking point in fostering a centralized administration. When that time comes, if it ever does, the utility commissioners can assemble in convention assured that conformity with the designs of our constitution will forestall federal usurpation of the rights of the states, and they can then devote their energies more exclusively to the perfection of regulation as an instrumentality of locally responsive government. This was not permissible at the convention which has just been held at Richmond because the threats to local autonomy are greater today than they have ever been and there is no organized opposition to the menace.

Expend marginal earnings for extensions and maintenance

IN SOME circles there is a strong disposition to discount the power issue in the belief that economic stress will emphasize other issues and thus leave it in the offing. One point must not be overlooked, however, and that is that the utility securities have come to be the last line of defense against complete evaporation of the liquid assets of banks and insurance companies. That is a commendable attribute of a security, but the

sharpness of the contrast carries a hazard. Utility earnings are good, at least good by comparison with the languidness of other business. But a show of even modest plenty in these days of economic stringency attracts the eye of the avid politician. Worse than that, an impoverished public is more than likely to look when the politician points a finger of scorn at an outstanding case of economic stability and solidity.

Does the situation call for a deliberate reduction in net receipts to the point where management can in turn point with pride to its participation in economic distress? Not a bit of it. It does mean, however, that every bit of margin not large enough to justify a rate adjustment should be expended judiciously.

This is no time to be niggardly. A marginal dollar spent now for needed maintenance and for keeping a working staff busied will be counted a contribution to relieving the present unemployment of men and money. Another marginal dollar devoted to extensions on a liberalized scale will pay future dividends on immediate good will of prospective customers who are at the moment not able to meet prevailing extension stipulations. These expended dollars, kept moving, will be that much delayed in arriving in some hoarder's hands. But, above all, their transfer to the expenditure column will allay much of the tendency to frown upon the generally healthy state of utilities while other businesses seem to be suffering with pernicious anemia.

Gaseous-discharge lamps await sponsored promotion

FOR several years the potentialities and shortcomings of gaseous-discharge lamps for commercial and home illumination have been alternately praised and damned by proponents and opponents. High light-producing efficiencies, flexibility in source arrangements and characteristics, as well as decorative possibilities, have been behind the expressed hopes of those who are advocates. Conceded difficulties are the auxiliary equipment needed for high- and low-voltage hot-cathode types, the low light output of cold-cathode types, the reduced over-all efficiencies as contrasted with source efficiencies, difficulties in securing white light, and the stroboscopic effect encountered with the regular on-and-off pulsations of gaseous-discharge sources. Poor power-factor characteristics and relatively low energy consumption have left power-company men lukewarm in the matter. It is difficult for the observer who must take a great deal on faith to determine just what the merits of the case may be.

Virtually white light can be produced. An interesting demonstration of grouped neon and mercury sources at the recent convention of the Illuminating Engineering Society showed that. A jewelry store in the new Waldorf-Astoria Hotel is lighted by gaseous-discharge sources, and although not a white light, the trade requirements seem to be well met. Other demonstrations of practicability have been made. Such flicker effects as are involved appear to be a rather minor consideration. Auxiliary equipment is the most formidable of all objections, but who can say that it is by any means an insuperable or even a major difficulty? It is, for example, conceivable that in a home lighted by gaseous-discharge sources all auxiliary equipment might be concentrated in a single unit in the basement automatically adjusting itself to utilization demands. Power-factor correction is but an element of the problem.

Home lighting is the most backward and deplorable condition in the lighting art of today. Except for inclosing shades and frosted lamps it is virtually where it was when the electric light first came in. While the theater, restaurant, hotel and shop have been remodeled to a new era the home remains neglected. Active sponsorship by manufacturers of light sources and built-in equipment for new homes and pseudo built-in elements for old ones might develop a market for energy and equipment of amazing proportions. We haven't begun to light. The public will gladly pay more if it gets more, but something to stir the imagination is needed since merely to offer more light is not enough. Gaseous-discharge sources offer one logical medium for large-scale built-in lighting where more light, area sources and flexibility are needed to keep up with decorative ideas of the period.

There is no need or justification for taking the attitude that such a development would injure seriously the business of the makers of incandescent lamps and fixtures and must therefore be stifled, for under intensive development there would be

more than enough business involved for all. There is little apparent likelihood of the gaseous-discharge source being more than a small brother to the incandescent lamp for some time to come, but a mighty important member of the family it could and should none the less be.

A compliment suggests thoughts worth pondering

ADVICE to manufacturers of farm equipment at the recent convention of their national association in Chicago by Edward A. O'Neal, president of the American Farm Bureau Federation, includes the suggestion that these manufacturers, with profit to themselves and to the farm population of the country, might form an organization patterned after the National Committee on the Relation of Electricity to Agriculture. This suggestion is the last of five points made by President O'Neal in his address. This point and the manner in which it was urged upon the farm-equipment manufacturers constitute a definite compliment to the committee just mentioned and a recognition of the great advances in rural electrification made under its direction by utilities and other agencies concerned.

Yet those active in farm electrification should not, in their complacence over Mr. O'Neal's compliment, neglect to consider the other four recommendations of his address. These are (a) a sales program based on scientific research to prove the utility of equipment, (b) development of a sound credit system to replace harmful dealer-payment plans, (c) publicity of uniform prices, and (d) a more direct system for economic and efficient distribution of farm equipment. The first of these points is almost an article of faith in the rural electrification creed; but it is still easy to point to too many instances in which that article of faith has been more honored in the breach than in the observance. There still remains much research to be done on the practicability of electric equipment for farm use, and there still remain too many cases of misapplication or even downright misrepresentation in the sale of electric devices and appliances to farm customers. The second of the four points deserves exhaustive study by electric utilities. Although many plans have been and are being tried, a generally satisfactory merchandising method for adequately supplying the farmstead with electrical equipment has not yet been worked out.

What will be done with these five suggestions?

FIVE suggestions were put forth in the trade policy report submitted at the recent convention of the Association of Electragists. After heartily indorsing the "statement of merchandising procedure" which has been agreed upon in the joint committee set up by the power industry and the hardware and department-store associations, the report listed the six principal causes of complaint on the part of electrical dealers and suggested "a practical contribution toward better industry relationships" by a correction of power-company merchandising policies in five particulars.

It seems unfortunate that the electrical dealers and contractors, who bear such an intimate relationship to the domestic appliance trade, were not invited into the joint committee. What other electrical men say about the power companies has great influence on public sentiment, and harmony within the family would seem to merit precedence over relations with the neighbors. But, be that as it may, the electrical contractor-dealer still remains a most important potential distributor for electrical appliances because of his growing commercial bent and his opportunity to pave the way for load by the installation of more adequate wiring.

The formal suggestions of the trade policy committee of the Electragists might, therefore, form the basis of some most effective work by the N.E.L.A. Commercial Section. These recommendations may be right; they may be wrong. The natural assumption would be that they are based on proven experience and mature consideration. But opinion and acceptance by power-company sales executives will vary with the individual and the locality. What more constructive contribution to this situation could be made by the Commercial Section this year than a thorough study of the principles involved in these five suggestions and a definite recommendation to the power industry?

Currency Depreciation Abroad May Help American Trade

By Dr. H. PARKER WILLIS
Formerly Secretary Federal Reserve Board

THE world at large has not yet recovered from the shock caused by the simple announcement that Great Britain had prohibited the export of gold. It still seeks an explanation of conclusive character, and it still asks the probable results of a step so little expected by the rank and file. Particularly does the business man, bewildered by this new turn of events, raise the question what will be the complicating factors with which he must struggle.

An answer to the latter question cannot be positively or immediately given. It depends, necessarily, upon the conclusion that is announced with reference to the future of British policy. There are evidently three courses of action which may be pursued by the British government. One is the restoration of the redemption of paper currency in gold, at least for export, as prior to the past summer, upon a basis equivalent to $4.8666; a second is the introduction of redemption upon a new basis, say equivalent to $3 or $3.50; a third is the abandonment of all effort to redeem in gold and a resort to the so-called "managed currency" footing. The effect of Britain's policy upon the trade of the United States will depend upon which of these courses of action may be followed in the future.

But, first, it is worth while to cast a glance at the influence exerted upon the returns from past business and trade by the action already taken. Every country is both debtor and creditor and most countries are both debtor and creditor on short- as well as upon long-term account. Great Britain had before the World War a holding of securities issued by foreign governments and individuals which was reckoned at not less than $15,000,000,000, the accumulation of a century of careful investing. No doubt she still has the bulk of them in her possession, save possibly $2,000,000,000 to $3,000,000,000 which were sold during the World War. Most of these securities, moreover, were stated in terms of British sterling. It has long been a cardinal element in British policy to insist that the debts and claims in which she dealt be stated in her own currency, and the Bank of England has for years past refused to accept or discount paper not so stated. British traders have, however, traded and dealt with many nations and in many kinds of currency and Britain has at all times had large open credits upon the books of foreign business men which were stated in their own money. Even since the great reduction of foreign trade from which British producers have suffered there has still remained a great balance currently due her.

With these facts in mind, it is easy to judge the effect (in general terms) of what has happened. In so far as Great Britain and her merchants were creditors of other countries in terms of sterling, they evidently stand to lose a sum equal to the difference between the old gold values of sterling and the price at which it is possible to buy remittances on England stated in paper sterling at the time when the debts are to be paid. The exception to be made to this general statement is furnished by those payments that were, when originally arranged, made payable in sterling of the then prevailing weight and fineness measured in gold. Such debtors must, evidently, undertake to pay not the nominal amount of sterling which they undertook to pay but sterling in paper sufficient to enable the British creditor to buy for himself, if he wishes it, a quantity of gold equal to the old gold value of the number of sterling originally to be paid him. It is not possible to say in what proportions Britain's claims and debts are stated simply in sterling and in what proportion in gold sterling. The nation as a whole will technically gain if the latter be in excess, and lose if the former be the larger. In a like fashion, open accounts and commercial claims will entail a loss to British credi-

What effect will world conditions, especially Britain's abandonment of the gold basis, have upon American business and finance? Will the American manufacturer benefit in the end from these conditions? The electrical industry, as well as others, is directly concerned.

Help in solving these problems should be found in the accompanying discussion of the currency situation by Dr. Willis, internationally known economist and financial adviser to foreign governments.

tors if they be stated merely in sterling, as in this case most of them will be paid in current exchange (paper) rather than in gold sterling, while claims which have been expressed in foreign currency, e.g., dollars, will yield a technical profit to holders since they will convert into more paper sterling than originally expected. An official committee is now at work in London casting up claims and debts as nearly as the facts at hand will permit, and when its work is done it will be possible for the general public to estimate what the result will be—whether a net loss or a net gain to the business and investing world.

Effect on British producers

Meantime, British traders must, of couse, undergo very varied experiences as the result of what has already occurred. There has been rejoicing in some of the manufacturing towns of England, owing to the establishment of the new and lower basis of currency because the change has been expected to better the state of trade. Such rejoicings are too early. What is meant by them is that with wages costing a given quantity of sterling in a given plant there would be no change since the shift to the new basis, but the rate of pay would continue unaltered. The producer would buy his labor in the home market and would sell his products in a foreign market. Since he would be paid abroad presumably in gold, say, in this country, he would get more gold money for a given unit of goods than he did before because he would profit by paying his wages in depreciated, and getting payment in full value, money. This would be true, obviously, only so long as the laborer proves willing to go on without an increase in wages nominally expressed in current paper sterling. As against these dubious profits, however, must be set the fact that since Britain produces but little in the way of raw materials, she will have to pay more sterling than formerly for her manufacturers' materials. With the pound at $3.90 the producer plainly has incurred a higher cost by about 25 per cent of the price of his materials.

Then, too, there must be borne in mind the fact that the British trader has to bear the cost of fluctuations of exchange, always a serious source of loss in such circumstances. True, he can reprice his goods in, say, dollars and thus make sure of getting payment in a currency at least as stable as that of his competitors; but there is always the constant probability that fluctuations in sterling, into which eventually he must convert his earnings, will wipe out any advantages he may gain in this way. A currency which is constantly fluctuating is one in which dealers do not like to operate, and there is every reason to fear that, with things as they are, the pre-eminence of British sterling as a world currency may be lost, the result being to make it subject to greater and more dangerous fluctuations in consequence than had been feared.

Manufacturers in other countries

Now what results must be expected by the traders and manufacturers in other countries who find their competition with British shippers subjected to the new conditions which have grown up out of the present exchange situation? Ever since the war Britain has been suffering a series of severe handicaps. There was the trouble caused by high wages stated in the war currency, and growing worse as time went on after the close of hostilities. There was the trouble due to fluctuating and unstable monetary standards. The stabilization measure of 1925 was intended to correct all these matters. Unfortunately, British labor was not willing to carry its share of the national cost of deflation, and the result was that, while British manufacturers had to meet the competition of the world, and especially of the United States, British labor was not willing to undergo a cut in wages corresponding to the greater purchasing power of the pound sterling. So British manufacturers after 1925 had to keep on paying wages on the inflated post-war basis, but they received payment for their merchandise in deflated pounds. They had to give too large a share to labor, partly in the way of excessive wages to those who worked, partly in the way of excessive unemployment insurance, or doles, to those who would not, or did not, work.

Now, British wages are being paid in depreciated sterling, but foreigners find British goods offered to them in the same currency as before (their own currency) by manufacturers who have a slightly larger margin for competitive purposes made available through the depreciation of sterling. Suppose, for example, that a British producer has been selling woolen goods landed and tariff-paid in the United States at $4.86 a yard. Suppose, further, that after charging off depreciation, paying wages and reducing his entire expenses of every sort to a yardage basis, he finds that his costs are $4.75, leaving him scarcely more than a 5 per cent profit. He evidently cannot meet any competition that will go below $4.86 without losing money. Suppose, now, he re-estimates his costs in his home plant and finds them unchanged—$4.75—but when he sells at $4.86 in the United States the money, instead of bringing him in one pound sterling as it did before the new gold policy was adopted, yields him one pound sterling and in addition about $1, as would be the case at recent exchange rates. He evidently has $1.10 more profit, or eleven times what he had before. In such circumstances, he is a much more formidable competitor and will be likely to spend a considerable part of his new profit in cutting prices in order to get business against the American manufacturer.

How long will this condition last? That will depend in some measure on the higher costs that must be paid by the British producer to get his foreign supplies of ma-

terial. For instance, suppose he is buying his raw wool in Argentina or Australia, he will be likely to find that an advance has taken place about in proportion to the fall in sterling. The same is true of cotton or any other product raised in the United States. If raw cotton on the farm be worth 6 cents the British producer will have to buy enough American money to provide 6 cents for every pound of cotton needed. This will cost him about 20 per cent more sterling at recent rates of exchange than was true before the new policy went into effect. Accordingly, the British producer will have to reduce his theoretical dollar of extra profit per yard, already figured in the case of woolen goods, by deducting the increase in the cost of raw materials. Still, this is likely not to be a very large cut in his prospective excess profits. The main outlay in Britain, as well as in other countries, will be found, in many articles of manufacture, to reside in labor cost and in capital or overhead expense. Eventually, therefore, the British producer is likely to go on as a formidable competitor until British labor has succeeded in "taking up the slack," so to speak, by insisting upon, and getting, higher wages proportionate to the reduction in the value of sterling. This, however, is usually a process that takes a good deal of time, unless the reduction in the value of money is very great, or is rapidly attained, or both. We may say, therefore, that so far as production costs go as the basis of international competition the British producer has been given by the change a material advantage as compared with the position he previously occupied.

Influence on American market

In the meantime, however, will Americans find their markets much disorganized by the alteration in competitive power that has supposedly occurred? That will differ a good deal from industry to industry. In some branches of business, where the competition is close, the larger margin of excess above cost may help the English producer a good deal, and may help him in neutral markets especially. It is to be borne in mind that the advantage he will enjoy is cumulative. Shipping companies will more or less share in it and can allow him better rates. As England controls the most and best of the commercial shipping of the world, an increased margin of 25 per cent ought to make it practicable to grant materially better prices and rates in shipping to such states as Argentina, Brazil and other parts of the world where the fight for markets is severe. There is some reason to fear that during the period of readjustment Americans will thus suffer somewhat in foreign markets through competition in articles that are closely priced and in which competition is already strong. This competition will require time to make itself fully felt, for reasons already stated. Eventually it will be felt.

The question has been raised, according to some journalists in Washington, whether it might not be well to give the tariff another twist upward, in order to meet this competition. The question might be arguable if this twist could be applicable to foreign markets. Unfortunately, it is not so applicable; the higher tariff rates would apply only to our own market. Here, however, the American producer already has things his own way. Due to the great reduction of prices of raw materials prices are now too high in most manufactured lines, so that the American producer has a large production-cost margin which he can use in competition, and he has at the same time a very high protection in most lines due to the tariff duties themselves. There seems no reason whatever to suppose that there will be any very great increase in the inflow of British goods into the United States under present conditions. In the foreign neutral markets the case is different, but there we have no artificial way of meeting competition, since we have practically excluded them from our markets.

British financing superior

There is another important consideration that requires some careful weighing. One phase of Britain's commercial domination in certain markets has been the fact that she has had much better financial machinery than we could supply. British branch banks and foreign credits, British ways of financing the buyer and producer in those markets, have long been superior to ours. The action taken in changing her gold policy will tend strongly to alter this situation. Not only will most nations be more loath to trade in terms of British currency and be inclined to turn to the dollar, so long as the present uncertainty and fluctuation continues, but the effect of such turning away from sterling is, inevitably, to shift banking credits out of the hands of British bankers and into our own hands. If we are sufficiently enterprising and energetic there can be little doubt that we can take for ourselves some part, at least, of this financing, and thereby make up for many competitive disadvantages.

There is one more possibility already included among those contemplated and enumerated above—that Britain will not go back to the gold standard at all, but will accept the dangerous scheme known as "managed money," a currency basis which accepts as a permanency the irredeemable currency base and undertakes to stabilize it around some fixed valuation, say $3 or $3.50, by sales of forward exchange and other methods of tinkering with and "pegging" exchange quotations. Should Britain accept this proposal, the outcome may be rather different from any thus far contemplated or considered. The essential effect of this currency management would be to put into the hands of politicians the control of prices and currency values. As is well known, the object of the "managed currency" advocates is, fundamentally, that of giving to labor as large a share of the national wealth as circumstances will permit. We may expect, therefore, that the level of prices in England, so far as controllable, will become the sport of politics. It is not, on the whole, subject to such control in any direct or effective way, owing to lack of knowledge as to the technique and working of what is termed "credit control" as well as lack of instrumentalities suited to price direction. It is therefore possible that the value of the pound sterling, dependent ultimately on the price level in England, will become so changeable and uncertain as to defeat the object of the whole undertaking, and particularly to make trade in sterling or long-term contracts for trade with England very much of a "gamble." In that case England must look forward to a gradual change in her status. She will probably gradually go out of business as an important foreign trade country and slowly pass to the position of a minor European state, self-contained and dependent upon her own internal resources. This is not at all out of the question; indeed, we have witnessed various just such changes in the status of nations within the past hundred years. It may be that Great Britain is now prepared and ready to make this significant

change. Some persons definitely predict it. This is conjecture. What is certain is that she will have to make the change, whether she wishes or not, if she loses her foreign trade, and that the present difficulties of dealing with the gold standard work powerfully against retention of that trade on its old basis. Yet there is an eminent chance of recovery—a chance that ought to be availed of by every possible means. If Great Britain determines to go back to the gold standard upon some basis, or, for that matter, determines to go back to almost any relatively stable basis of currency, she may recover and hold a substantial portion of her business. This, however, she can never do if she permits herself to give over to the politician the function of tinkering with, or "regulating," the value of her currency either by the use of methods of "credit control" or by others of similar effect. Foreign competitors of Great Britain will find that the condition of their success in taking away her trade depends essentially upon the decision that may be arrived at in this matter.

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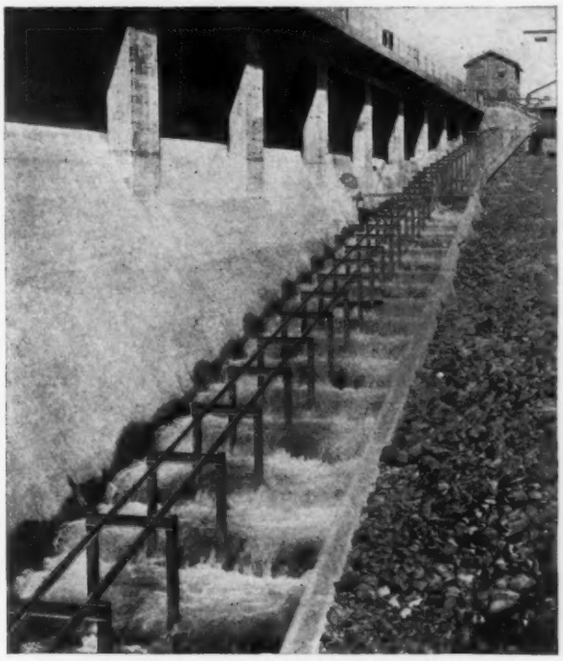
Fish Ladder for Columbia River

The construction of the Rock Island hydro-electric development now in progress on the Columbia River near Wenatchee, Wash., for the Puget Sound Power & Light Company brought with it the difficult problem of allowing migratory fish to pass the dam.

The Columbia River is one of the principal salmon streams in North America, and every spring and summer enormous numbers of these fish return to the river to breed. From the ocean they pass up the main stream to the shallow waters of the tributaries. In the interest of the fisheries industry, the federal government has required the construction at Rock Island of two fish ladders which will probably be the largest of their kind. The design of these ladders is the result of co-operation between the Stone & Webster Engineering Corporation and the officials of the United States Bureau of Fisheries. Each ladder has adjustable stop-log barriers, is of rock and concrete and is 20 ft. wide with a slope up and downstream of 1:10. Since the maximum difference in water levels at the dam will be over 50 ft., the ladders are each 500 ft. long. One is on the east and one on the west bank of the river, each along the downstream side of a concrete abutment section with openings through the abutment at various levels to allow a flow of water into the fishway and to permit the upstream passage of fish into the reservoir.



Stop-log adjustments are to be made from a platform carried by the central steel frame

The fishway is designed to admit salmon to the upper pond through a variation of about 25 ft. in headwater level, and the height of each stop-log barrier is adjustable for regulation of water levels in the fishway to suit various headwater levels.

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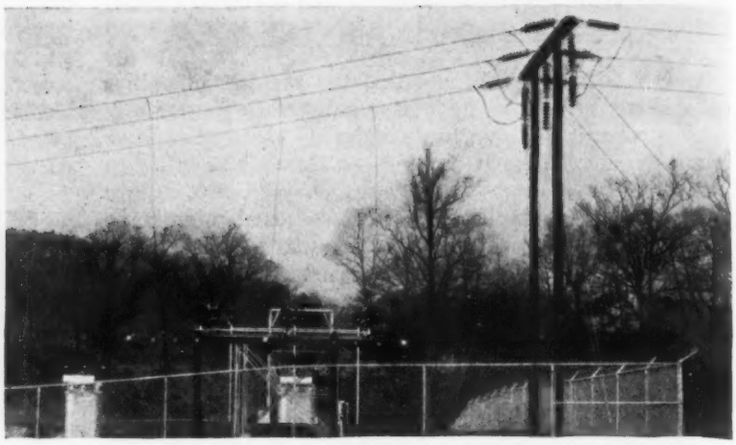
Recommended Intensities of Illumination for Store Interiors*

Type of Store or Location	Foot-Candle Intensity
Automobile showrooms	15
Barber shop and beauty parlors	15
Clubrooms:	
Lounge	5
Reading room	12
Elevators (freight and passenger)	6
Halls and passageways	3
Locker rooms	6
Offices:	
Close work	15–20
General (no close work)	10
Reception room	6
File room	6
Showcases — four times that of store proper	
Stores—Department and Large Specialty:	
Main floors	15–25
Other floors	12–15
Basement store	15
Stores — Medium Size:	
Art	12
Automobile supply	12
Bake shop	12
Book	12
China	12
Cigar	15
Clothing	15–20
Confectionery	12
Dairy products	12
Decorator	12
Drug	15
Dry goods	15–20
Electrical supply	15
Florist	12
Furrier	15–20
Grocery	15
Haberdashery	15
Hardware	15
Hat	15
Jewelry	15–20
Leather goods, luggage shops	15
Meat	12–15
Millinery	15
Music	12
Notions	12–15
Piano	10–12
Shoe	15–20
Sporting goods	12–15
Tailer	15–20
Tobacco	15
Variety store	15
Toilets and washrooms	6

*As indicated in "Recommendations and Specifications for General Lighting and Wiring of Retail Store Buildings," a report of the store lighting subcommittee, lighting service committee, Illuminating Engineering Society, presented at the recent annual convention.

Tapping a 110-Kv. Trunk Line to Serve a Small Community



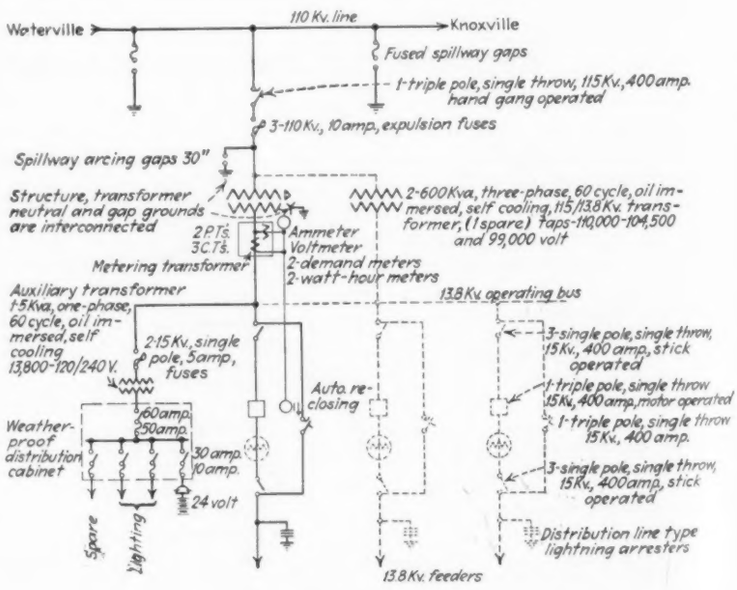
Tapping substation of relatively simple design

Sevierville, a 110/13.8-kv. substation of the Tennessee Public Service Company, represents another effort on the part of the power companies to provide a small community with good electrical service from a high-voltage trunk line without unduly hazarding the trunk-line service. The design features a minimum quantity of high-class apparatus in a single arrangement.

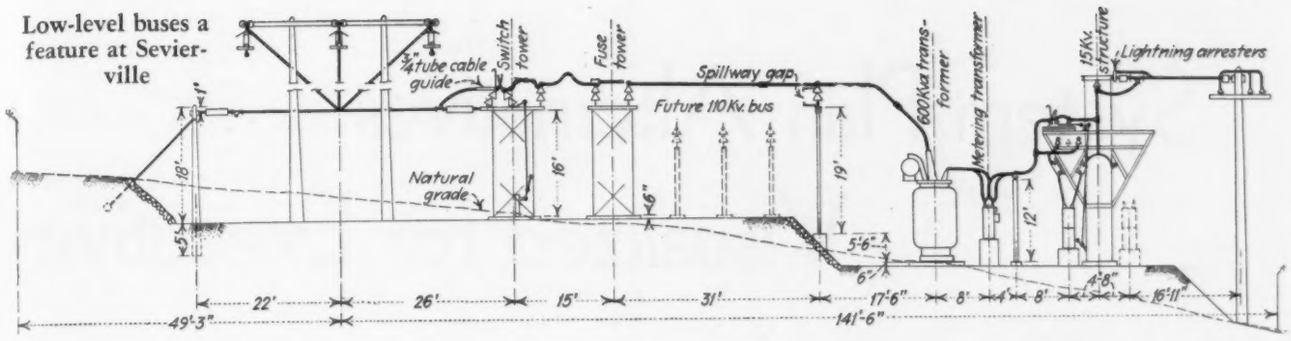
The substation takes power from the single-circuit 110-kv. Waterville-Knoxville transmission line. This line is 52 miles long and is the main power supply to the city of Knoxville, Tenn. It also interconnects the Carolina Power & Light Company and the Tennessee Electric Power Company systems. The importance of the line as a trunk feeder made it necessary to design the Sevierville substation so that the tap would not jeopardize or interfere with service to Knoxville. As the substation was in an isolated location and approximately 4 miles from Sevierville, it was necessary to consider also the integrity of the substation itself as a primary consideration so that the service to Sevierville would be satisfactory and the maintenance and operating cost would be a minimum.

Connections and protection used are shown in the one-line wiring diagram. To provide lightning protection for the substation and at the same time avoid as far as possible transmission line interruptions a combination of fused and solidly grounded spillway gaps were used. The two sets of fused spillway gaps were installed on the two line structures adjacent to the tap connection. The solidly grounded spillway gaps were installed near the high-tension terminals of the step-down transformers.

The cost of a 110-kv. oil circuit breaker prohibited its use in a substation of this small capacity, so 110-kv. expulsion fuses were used to disconnect the substation from the line in case of trouble in the substation itself. The low-tension oil circuit breaker was depended upon to protect the step-down transformer from overloads and 13.8-kv. circuit troubles. Two 600-kva., three-phase, 110/13.8-kv. transformers were installed, one unit being a spare. The neutrals of the 13.8-kv. side of the step-down transformers were solidly grounded to provide for positive and rapid ground relaying. The 13.8-kv. breaker is the conventional outdoor automatic reclosing type and tests the circuit three times, if necessary, before locking in the open position.


Waterville
110 Kv. line
Knoxville
Fused spillway gaps
1-triple pole, single throw, 115 Kv., 400 amp. hand gang operated
3-110 Kv., 10 amp., expulsion fuses
Spillway arcing gaps 30"
Structure, transformer neutral and gap grounds are interconnected
2-600 Kva, three-phase, 60 cycle, oil immersed, self cooling, 115/13.8 Kv. transformer, (1 spare) taps-110,000-104,500 and 99,000 volt
2 P.T.s.
3 C.T.s.
Ammeter
Voltmeter
Metering transformer
2-demand meters
2-watt-hour meters
Auxiliary transformer 1.5 Kva, one-phase, 60 cycle, oil immersed, self cooling 13,800-120/240 V.
13.8 Kv. operating bus
2.15 Kv., single pole, 5 amp., fuses
Auto. reclosing
3-single pole, single throw, 15 Kv., 400 amp., stick operated
1-triple pole, single throw 15 Kv., 400 amp., motor operated
1-triple pole, single throw 15 Kv., 400 amp.
3-single pole, single throw, 15 Kv., 400 amp., stick operated
60 amp.
250 amp.
Weather-proof distribution cabinet
30 amp.
10 amp.
24 volt
Spare
Lighting
Distribution line type lightning arresters
13.8 Kv. feeders

Schematic plan for station



All equipment was specified as self-protecting so that excessive transient voltages should discharge over the exterior of the bushings rather than puncture the bushings or damage the internal insulation. The 110-kv. substation insulation was co-ordinated so that excessive transient voltages should discharge over the grounded spillway gaps rather than discharge over or puncture any bus or equipment insulation; the 13.8-kv. insulation was also co-ordinated in a similar manner, and for this purpose cover type bushings were specified on the auxiliary transformer and metering equipments. In addition, line type lightning arresters were installed on the outgoing 13.8-kv. circuit.

As the design provides a high level of insulation and self-protective features reliable operation and continuity of service are expected. While the installation is not the cheapest that could be obtained, its simplicity with a minimum of equipment has permitted a reasonably low cost.

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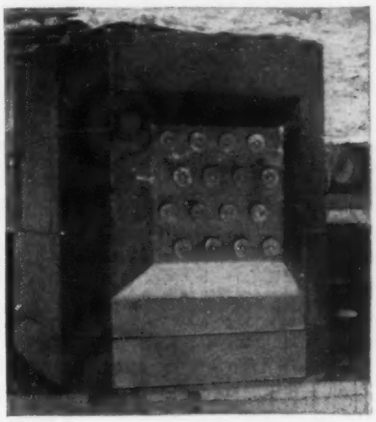
Steel Forms for Concrete Manholes Show Economies

By A. J. BATCHELOR

Superintendent Underground Department
Toledo Edison Company, Toledo, Ohio

Saving of $27.10 per job on labor alone is realized by the Toledo Edison Company through the use of steel forms for building concrete underground system manholes. In the year since these forms were adopted the company has used them eight times. Including the fixed charges on the investment of $625 in the steel form the economy of their use shows a saving of $26.18 per job as against wood forms.

The assembling of the steel form takes four men three hours, and a hammer is the only tool necessary, whereas the building and placing of the wood forms takes a carpenter and three laborers fourteen hours. But little sheathing to avoid cave-in is necessary with the steel forms, as all excavation and concrete pouring is done in from ten to twelve hours. With wood forms it is usually necessary to excavate and sheath the hole one day and place the form and pour concrete the next day.



Assembled steel form for manhole

In all cases the manholes built were 6 ft. wide, 8 ft. long and 7 ft. deep with recesses at the ends. A manhole built with the steel form has a much smoother wall and is true to shape. With the wood form, if the bracing is not carefully placed, the walls are liable to bulge, making it hard to place racks to support cables. The steel forms are flexible and it is possible to build a variety of sizes of manholes with the same set of sections.

As to the life of these forms, the Toledo company is satisfied that they can be used hundreds of times without appreciable wear if properly handled and cared for. Also, as is readily apparent from the foregoing comparisons, the cost of the steel form manholes rapidly decreases as the number of jobs increases.

Breakdowns of the labor and the total costs, using this method of manhole construction, are given in the accompanying tables.

Table I—Comparison of Labor Cost Only

1. Placing steel forms takes four men three hours	$6.00	
2. Removing steel forms takes four men two hours	4.00	
3. Cleaning steel form takes two men one hour	1.00	
4. Labor cost for steel form, total		$11.00
5. Building and placing wood forms takes four men fourteen hours	30.10	
6. Removing and cleaning wood form takes four men four hours	8.00	
Labor on wood form, total		$38.10
7. Difference in labor cost between steel and wood forms.		$27.10

Table II—Comparison of Total Cost

1. Cost of steel form	$625.00	
2. Fixed charges, 15 per cent	93.75	
3. Fixed charge cost of one manhole (divide by 8)	11.72	
4. Labor cost of steel manhole	11.00	
5. Total cost of steel manhole		$22.72
6. Cost of lumber for wood forms (600 sq.ft.)	27.00	
7. Labor cost on wood forms	38.10	
8. Lumber salvage (60 per cent)	16.20	
9. Total cost of wood form manhole		48.90
10. Difference between cost of steel and wood forms		$26.18

System Plan Alternatives Visualized for Executives

By M. M. SAMUELS
Electrical Engineer, New York, N. Y.

Expansion forecasting affected by current uncertainties. Load prognostication on population basis safer than on customer total. Significance of each plan can be condensed to tabular form for executive action.

Essential criteria are power costs, capital required, plant factors and degrees of reliability.

UNCERTAINTY about loads of the next decade makes it imperative that load-growth estimates be built on sound assumptions and procedure and then be so set up for executive scrutiny as to disclose exactly what each alternative plan will signify in each of the years during which it is unfolded. In making the load-growth estimates it is undoubtedly more reliable to base them upon population than upon number of customers. Also, in summarizing the virtues of alternative plans of system expansion to meet those growths of consumption it has been found possible to display all the essential attributes of all feasible plans on two sheets of letter-size paper. The executive then has before him for decision and for the purposes of financial budgeting a comprehensive picture of his engineers' proposals in terse statistical fashion and stripped of argumentation and opinion.

President Hoover estimates the additional generating capacity for the United States to be 25,000,000 hp. in the next twenty years. Paul S. Clapp, managing director of the National Electric Light Association, estimates 30,000,000 hp. growth in the next ten years. Such divergent figures can hardly be used for the purpose of establishing a financing program, construction program or interconnection program for any ensuing period. Moreover, the corporate tendency to reduce capital investment to a minimum conflicts with the public tendency to expect continuity of service and continued rate concessions. A careful scrutiny of the principles upon which growth estimates are to be founded is therefore necessary.

"District," "load center," "system" defined

Before proceeding, however, to make such an estimate it will be well to formulate some system definitions in order to remove ambiguity from the phraseology. A paper by Alexander Bauhan, presented at the recent convention of the A.I.E.E., gives an excellent set of definitions for terms commonly used in interconnection programs, such as "firm power," "peak," "diversity," etc. To these may be added the following simple definitions of terms which, in spite of their simplicity, are often found to be confused even in very recent investigations:

1. *District.*—A district is a territory which is supplied from one or more power houses or one or more important substations by low-tension lines only. Transmission costs do not enter into the calculation of energy costs for a district, since a district is taken care of only by distribution lines and not by transmission lines. It must be decided in each case which is the highest distribution voltage and which the lowest transmission voltage of the system, in accordance with the bookkeeping methods in vogue on the particular system.

2. *Load Center.*—A load center is the location of an important power house or substation obtaining energy directly from generators or from high-voltage transmission lines and supplying one or more districts by low-tension distribution lines. Distribution costs do not enter into the cost of energy at load center; only generation and transmission costs are considered here.

3. *System.*—A system contains one or more load centers which may be either interconnected or not interconnected. The cost of energy for the system is the average cost per kilowatt-hour at all load centers combined for the period of one year. (Transmission costs are already included in the cost at each load center; distribution costs are already included in the cost for each district.)

In the past it has been common practice to estimate load per consumer instead of per capita of population, then to proceed to estimate the number of consumers, to divide this number into classes, such as "domestic," "industrial," etc., and to assume a rate of growth for each class. Even though this procedure would seem necessary for a distribution estimate, the possible errors involved are numerous, and for total loads it will be preferable to estimate the total load per capita of population, thus obtaining an average in which only one error is possible. Of course, there are cases in which one large customer is expected to take a great amount of energy, such as, for instance, an expected railroad electrification or a new industry; but such unusual cases can be left out of the per capita estimate and entered as an additional total item.

The following would seem to be the best procedure for preparing a population estimate. It is not quite the orthodox method used by economists, but it is much simpler and more suitable to the present problem. The possible difference in error between this and the orthodox

method will, no doubt, be less than the error between any of the methods on one hand and actual conditions on the other.

A record should be prepared in tabulated form of the population of the area supplied from each load center for each of the past twenty years, and from this tabulation there should be established the "average past growth" in per cent per annum; after giving due consideration to unusual conditions that may have prevailed in same year.

From the "average past growth" it should be possible for local managers to assume a reasonable percentage for "average future growth," and on the basis of this percentage the total population of all districts which are supplied from a load center should then be estimated and recorded for the next five, ten, fifteen or twenty years, as may be called for in a definite case. It is difficult at the present uncertain stage of things to make rational predictions as to future population. It may, therefore, be advisable to add the following reasoning to the managers' experience and their acquaintance with local conditions. For the next twenty years, for the whole United States, President Hoover estimates a total growth of 20,000,000 in population, which is 0.756 per cent per year on the basis of annual compounding. For the past twenty years likewise, on the basis of annual compounding, the growth was 1.46 per cent per year, so that Mr. Hoover estimates the "average future growth" to be about 51.7 per cent of the "average past growth," both over twenty-year periods. Unless the local managers have some definite reasons for a faster or slower rate of growth for a definite period (and such reasons should be given in the report in detail), it may be assumed that Mr. Hoover's ratio will be fairly uniform throughout the whole country. If, therefore, the "average past growth" for a district is established, for instance, at 2 per cent, the "average future growth" may be assumed as 1.034 per cent. The following well-known formula may be quoted here:

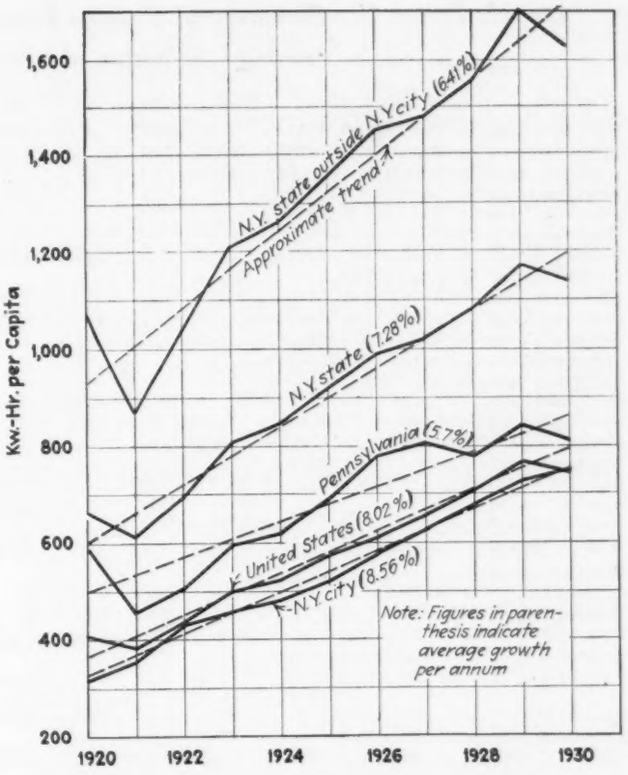
Population after n years (P_n):

$P_n = P_p (1 + r)^n$, where

P_p = present population

r = percentage rate of annual growth each year over previous year (in decimals).

The estimate or report should contain a significant selection of past load curves for each district, for each load center and for the system. In many cases it should be possible to get along even without district load curves, using load-center curves only, and in some cases only system curves may be required. While it may be convenient to develop estimated future load curves for districts, load centers and systems and make them a part of the record in the estimate, it will be found that with the method recommended here such estimated curves will not really be needed for estimating. But they will help in the future to check actual conditions with estimated conditions and so adjust continually the estimate to actual conditions. Here, too, the importance of correctly recording all assumptions is emphasized.



Generation—kilowatt-hours per capita of population

Even though there are great differences in the real values, the differences in per cent growth per capita per annum are not very great. If the dashed lines had been estimated, they would have been sufficiently accurate.

Form Used by the Author for Analyzing One Individual Plan

Plan J—A Typical Summary

	Year	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940
1	Generating capacity, 1,000 kw	220.0	220.0	255.0	290.0	325.0	360.0	360.0	360.0	390.0	390.0
2	Purchase capacity, 1,000 kw	89.3	90.4	66.4	67.4	58.9	59.9	60.9	61.9	62.9	63.9
3	Generating and purchase capacity, 1,000 kw	309.3	310.4	321.4	357.4	383.9	419.9	420.9	421.9	452.9	453.9
4	Energy generated (net), 1,000,000 kw.-hr.	858.7	958.6	1,065.6	1,170.4	1,288.2	1,379.8	1,468.8	1,559.4	1,651.6	1,743.2
5	Energy purchased, 1,000,000 kw.-hr.	131.3	138.3	123.8	115.5	93.0	98.5	106.5	113.0	119.5	126.0
6	Energy generated and purchased, 1,000,000 kw.-hr.	990.0	1,096.9	1,189.4	1,285.9	1,381.2	1,478.3	1,575.3	1,672.4	1,771.1	1,869.2
7	Generated energy delivered, 1,000,000 kw.-hr.	843.0	941.0	1,046.5	1,149.0	1,265.3	1,355.3	1,442.8	1,531.8	1,622.3	1,712.3
8	Purchased energy delivered, 1,000,000 kw.-hr.	131.3	138.3	123.8	115.5	93.0	98.5	106.5	113.0	119.5	126.0
9	Generated and purchased energy delivered, 1,000,000 kw.-hr.	973.4	1,079.3	1,170.3	1,264.5	1,358.3	1,453.8	1,549.3	1,644.8	1,741.8	1,838.3
10	Losses—No. 6 less No. 9, in per cent of No. 6	1.6	1.6	1.6	1.7	1.7	1.7	1.65	1.65	1.65	1.65
11	Plant factor—No. 1 and No. 4, per cent	44.5	49.7	47.7	46.1	45.2	43.8	46.6	49.4	48.	51.0
12	Cost per generated kw.-hr. (No. 4), mills	7.08	6.12	6.37	6.50	6.55	6.65	6.34	6.10	6.11	5.89
13	Cost per purchased kw.-hr. (No. 5), mills	8.75	8.72	8.65	8.37	7.70	7.65	7.57	7.53	7.50	7.46
14	Average cost per kw.-hr. (No. 6), mills	7.51	6.44	6.60	6.66	6.64	6.72	6.43	6.29	6.19	5.99
15	Cost per generated delivered kw.hr. (No. 7), mills	7.19	6.20	6.57	6.75	6.94	6.95	6.64	6.36	6.38	6.14
16	Cost per purchased delivered kw.hr. (No. 8), mills	8.75	8.72	8.65	8.37	7.70	7.65	7.57	7.53	7.50	7.46
17	Average cost per delivered kw.hr. (No. 9), mills	7.21	6.52	6.80	6.90	6.99	7.00	6.70	6.44	6.46	6.22
18	New investment, in dollars (1,000)	4,875.0	0	4,553.7	4,335.2	3,265.0	3,062.3	82.8	0	2,956.6	0
19	Degree of reliability, I, II, III, IV, V or VI	1	1	1	1	1	1	1	1	1	1

Double Letter Size Summary of Various Plans Used by the Author for Presenting to Executive

Sheet No. 1—Program of Generators, Lines and Purchase Contracts

	Plans of Report												
	A	B	C	D	E	G	H	I	J	K	L	M	N
New power house "A" first Unit, 35,000 kw..	1933	1930	....	1930	1930	1930	1930	1930	....	1930	....	....	1930
New power house "A" second Unit, 35,000 kw.	1935	1931	....	1931	1931	1931	1931	1931	....	1931	....	....	1931
New power house "A" third Unit, 35,000 kw.	1937	1933	....	....	....	1933	1933	1939	....	1935	....	....	....
New power house "A" fourth Unit, 35,000 kw.	1939	1935	....	....	....	....	1935	....	....	....	....	....	....
New power house "A" fifth Unit, 35,000 kw..	....	1937	....	....	....	....	....	....	....	....	....	....	....
New power house "A" sixth Unit, 35,000 kw..	....	1939	....	....	....	....	....	....	....	....	....	....	....
Old power house "B," Unit, 35,000 kw.....	1930	....	1930	1933	1939	....	1934	1937	1930	1933	1930	1930	1938
Old power house "C," Unit, 25,000 kw.....	1931	....	....	....	....	....	....	....	1931	....	....	1931	....
New power house "D," first Unit, 35,000 kw.	....	....	1930	1935	....	....	....	....	1932	....	....	....	....
New power house "D," second Unit, 35,000 kw.	....	....	1931	1939	....	....	....	....	1934	....	....	....	....
New power house "E," first Unit, 35,000 kw...	....	....	1931	1937	....	1935	1937	....	1933	1937	1933	1933	....
New power house "E," second Unit, 35,000 kw.	....	....	1932	....	....	1937	1939	....	1935	1939	1935	1935	....
New power house "E," third Unit, 35,000 kw.	....	....	1935	....	....	1939	....	....	1938	....	1938	1938	....
New power house "E," fourth Unit, 35,000 kw.	....	....	1938	....	....	....	....	....	....	....	....	....	....
New power house "F," first Unit, 22,000 kw.	....	....	....	....	1932	....	....	1932	....	....	1932	1932	1932
New power house "F," second Unit, 22,000 kw.	....	....	....	....	1932	....	....	1932	....	....	1934	1934	1935
New power house "F," third Unit, 22,000 kw.	....	....	....	....	1932	....	....	1932	....	....	1934	1935	1936
Line "G," first Circuit.....	1930	1930	....	1930	1930	1930	1930	1930	....	....	....	....	....
Line "G," second Circuit.....	1934	1934	....	1934	1934	1934	1934	1934	....	....	....	....	....
Line "H," first Circuit.....	1931	1931	....	1931	1931	1931	1931	1931	1932	1931	1933	1933	1931
Line "H," second Circuit.....	1936	1936	....	1936	1936	1936	1934	1936	1934	1934	1934	1934	1936
Power contract status:													
Contract X-1, 10,000 kw. Firm.....	Con.	Con.	Con.	Con.	Con.	Con.	Dis.	Dis.	Dis.	Dis.	Dis.	Dis.	Dis.
Contract X-2, 15,000 kw. Firm.....	Con.	Con.	Con.	Con.	Con.	Con.	Dis.	Dis.	Dis.	Dis.	Dis.	Dis.	Dis.
Contract X-3, 13,500 kw. Firm.....	Con.	Con.	Con.	Con.	Con.	Con.	Dis.	Dis.	Con.	Con.	Con.	Con.	Con.
Contract X-4, 13,500 to 25,000 kw. Firm.....	....	....	....	....	....	....	....	....	Con.	Con.	Con.	Con.	Con.
Contract X-5, 10,000 kw. Emergency Special.	....	....	....	....	....	....	....	....	....	....	1931 to 1933 only	....	....
Contract Y-1, 9,600 kw. Firm.....	Con.	Con.	Con.	Con.	Con.	Con.	Dis.	Dis.	Dis.	Dis.	Dis.	Dis.	Dis.
Contract Y-2, 23,000 kw. Emergency.....	....	....	....	....	....	....	....	....	Con.	....	Con.	Con.	....
Contract Z-1, 15,000 kw. Emergency.....	Dis. 31	Dis. 31	Dis. 32	Dis. 34	Dis. 31	Dis. 31	Dis. 31	Dis. 31	Con.	Con.	Con.	Con.	Con.
Contract Z-2, 25,000 kw. Emergency.....	....	....	Dis. 31	....	....	....	....	....	....	....	....	....	....

NOTE: Con. = Purchase by contract continued. Dis. = Purchase by contract discontinued.

Sheet No. 2—Unit Costs, Capital, Reliability at a Glance

Year / Plan	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	
	Over-All Cost Per Kilowatt-Hour at Load Centers in Mills										
A.....	6.65	6.61	6.38	6.94	6.32	6.47	6.27	6.28	6.06	5.81	
B.....	6.65	6.64	6.34	6.42	6.40	6.55	6.70	6.34	6.14	6.18	
E.....	6.67	6.65	6.35	7.44	6.86	6.73	6.50	6.34	6.27	6.22	
G.....	6.65	6.63	6.35	6.43	6.41	6.67	6.43	6.49	6.39	6.29	
H.....	6.66	6.64	6.29	6.41	6.31	6.45	6.25	6.47	6.21	6.20	
I.....	6.66	6.65	6.29	7.44	6.48	6.40	6.24	6.26	6.08	6.03	
J.....	7.21	6.52	6.80	6.90	6.99	7.00	6.70	6.44	6.46	6.22	
K.....	6.76	6.70	6.42	6.54	6.16	5.86	6.08	6.39	6.19	6.57	
L.....	7.19	6.44	6.81	6.92	6.87	6.93	6.67	6.46	6.52	6.31	
M.....	7.36	6.52	6.88	7.08	7.00	7.05	6.79	6.56	6.60	6.41	
N.....	7.47	6.70	6.90	6.81	6.40	6.40	6.47	6.36	6.33	6.16	
	New Capital Invested, Dollars (1000)										Total
A.....	4,619.5	1,875.0	0	4,166.0	0	4,254.6	0	2,800.0	0	2,800.0	20,515.1
B.....	6,148.2	2,800.0	0	3,256.0	0	4,504.6	0	2,800.0	0	2,800.0	22,308.8
E.....	6,148.2	2,800.0	0	13,706.0	671.0	1,211.9	0	0	0	2,975.0	27,512.1
G.....	6,148.2	2,800.0	0	3,247.0	0	5,544.3	0	2,882.9	0	2,800.0	23,422.4
H.....	6,148.2	2,800.0	0	6,578.8	0	3,844.3	0	4,073.2	0	2,882.8	26,327.3
I.....	6,148.2	2,800.0	0	13,636.0	670.8	1,212.1	0	2,975.0	0	2,800.0	30,242.1
J.....	4,875.0	0	4,553.7	4,345.2	3,265.0	3,062.3	82.8	0	2,956.6	0	22,974.0
K.....	5,328.4	2,800.0	0	3,723.8	0	3,764.3	0	4,073.0	0	2,883.0	22,572.5
L.....	3,000.0	0	8,550.0	7,024.0	2,030.0	4,263.0	83.0	0	2,800.0	0	27,750.0
M.....	4,875.0	0	8,550.0	7,024.0	2,030.0	3,993.0	353.0	0	2,800.0	0	29,625.0
N.....	5,328.4	2,800.0	8,550.0	2,606.0	753.7	2,231.1	1,870.8	0	3,000.0	0	27,141.0
	Degree of Reliability										
A.....	IV	IV	IV	IV	IV	IV	III	III	III	III	
B.....	IV	IV	IV	IV	IV	IV	III	III	III	III	
E.....	IV	IV	IV	IV	IV	IV	III	III	III	III	
G.....	IV	IV	IV	IV	IV	IV	III	III	III	III	
H.....	IV	IV	IV	IV	IV	IV	III	III	III	III	
I.....	IV	IV	IV	IV	IV	IV	III	III	III	III	
J.....	I	I	I	I	I	I	I	I	I	I	
K.....	IV	IV	IV	IV	IV	IV	III	III	III	III	
L.....	I	I	I	I	I	I	I	I	I	I	
M.....	I	I	I	I	I	I	I	I	I	I	
N.....	IV	IV	IV	IV	IV	IV	III	III	III	III	
	Over-All Plant Factor of Generating Plants, Per Cent										
A.....	52.2	51.8	56.6	53.2	57.4	54.2	58.0	55.3	58.7	56.1	
B.....	52.1	49.5	54.1	51.1	55.4	52.7	56.3	54.2	52.3	55.6	
E.....	52.1	54.5	54.1	41.6	44.9	48.2	51.8	55.2	58.5	55.8	
G.....	52.0	49.4	45.7	51.0	55.1	52.5	51.2	53.6	52.0	54.7	
H.....	52.0	51.7	54.2	45.2	52.7	50.8	54.0	52.0	55.0	58.3	
I.....	52.1	49.5	54.1	41.7	48.7	52.0	55.3	46.6	49.3	48.4	
J.....	44.5	49.7	47.7	46.1	45.2	43.8	46.6	49.4	48.3	51.0	
K.....	51.2	48.6	54.0	51.3	56.5	53.6	52.0	54.2	52.4	54.9	
L.....	50.2	56.1	54.3	47.6	45.3	43.8	46.6	45.7	48.4	51.0	
M.....	44.5	49.7	48.8	43.8	42.1	40.9	43.6	46.2	45.4	48.0	
N.....	51.5	48.7	48.0	48.4	53.2	52.8	52.3	55.4	52.9	55.8	

The method of estimating "load per capita" and "peak per capita" which is suggested here is not to take the place of the experience and judgment of utility managers; neither is it intended as a definite formula which could be used promiscuously for estimating load. The problem is too complex for such simplicity. It is probably the most difficult and most important problem confronting the utilities today, because all their future planning as regards new generating units, new transmission lines, new distribution and the corresponding financing must be based on such estimates. The suggestions made here are intended as additions to experience and good judgment; they should help systematize and rationalize such experience and judgment. An experienced utility man's quick guess is often more dependable than volumes of engineering reports, even though the experienced man making the guess may not be able to give a reason for it quickly. But in the end it is not really a guess. Rather is it a subconscious application of experience, and experience accumulated in the subconscious is often called an instinct. As regards peak it may be mentioned that a definite statement must be made as to its meaning, because there are too many definitions.

In addition to the distinction between hourly, daily, monthly and yearly peaks, local peaks, district peaks, load-center peaks and system peaks, it is also necessary to distinguish between kw. peaks and peak energy in kilowatt-hours. Both of these are important and must be estimated before a program can be recommended for taking care of future load conditions.

The following procedure would seem entirely rational for future load estimates:

Record of past loads

For each load center prepare a tabulation, giving for each of the past ten or twenty years the actual consumption of each district and the corresponding consumption at load center (inclusive of distribution losses), the total consumption of all districts at load center, the consumption at load center per capita of population, the annual increase or decrease in consumption per capita in per cent, the peak at load center developed from load curves, the peak per capita, the annual increase or decrease in peak per capita in per cent. If the necessary information is available, the records of water consumption in the area per capita, as well as the peaks of water consumption, should be entered for comparison.

From the above the "average past growth in load per capita" and the "average past growth in peak per capita" can be established in a manner similar to that used in establishing the "average past population growth."

It now becomes necessary to make the most important assumptions, the "future increase or decrease in load per capita" and the "future increase or decrease in peak per capita." A definite tabulation of past conditions as given above, superimposed upon the local managers' knowledge of local conditions and prospects, should make it possible to make assumptions for "future rate of growth of consumption per capita" and "future rate of growth of peak per capita" which will be better than guesses. But all conditions upon which these assumptions are made should be stated in detail in the report, to make it possible for an accepted program based on these assumptions to be adjusted later if it is found that the conditons upon which they are based have changed.

It may also be well to check the assumptions with those made by municipalities for future water requirements per capita. There are no statistics available which would give the consumption in kilowatt-hours per capita or the peak per capita for the United States. But it is possible from available statistics to obtain the generation per capita, which shows a steady rise except for the years 1921 and 1930, these showing a small decrease. If there is no definite local information upon which to base any assumption, it may be well to assume a further decrease of 3 per cent for 1931, stationary conditions for 1932 and then an annual increase equal to the above established "future annual increase."

After the assumptions for "future rate of increase in consumption per capita" and the "future rate of increase in peak per capita" have been made, the future consumption and peak can be entered for each future year that is being considered.

This procedure should be carried through for each load center.

Consumption per capita after n years (C_n):
$C_n = C_p\,(1 + q)^n$ kw.-hr., where:
C_p = present consumption per capita in kw.-hr.
q = per cent increase per annum in kw.-hr. per capita (in decimals).

Using the formula quoted above for population, the total consumption in kilowatt-hours after n years (L_n) would be: $L_n = P_p\,(1 + r)^n \times C_p\,(1 + q)^n$.

Similar formulas can be set up for the peak in kw. and the peak energy in kilowatt-hours.

For a system containing two or more load centers which are already interconnected the various load centers should be combined into one system in the same manner in which districts were combined into load centers in the above procedure. Here transmission should be included in the same manner as distribution was taken care of above, and the system peaks should be built up from the load-center load curves. Thus the total kilowatt-hours to be delivered by all power houses of the system and all purchase contracts can be obtained for each future year, as well as the system peak in kw. and peak energy in kilowatt-hours for each year.

For all new plans that may be proposed to take care of the additional load and the additional peak—whether new generation, or new interconnection, or purchase, or two of these, or all three combined, are considered—the investigation can be so made that it finally leads to a tabulation for each plan for each year for the next five, ten, fifteen or twenty years, according to the number of years that it appears advisable to figure ahead, as illustrated on page 779. The degrees of reliability referred to in that tabulation are defined as follows:

I. Each load center has sufficient local generating capacity for all emergencies and also at least one incoming circuit from an outside source.

II. Same as "I," except that in some load centers an outside source is not available.

III. Some load centers have insufficient generating capacity for emergency, but incoming supplies from at least two separate sources, each at least a double circuit of good construction.

IV. Same as "III," except single circuits.

V. Same as "III," except only one source—double circuit.

VI. Same as "V," except single circuit.

In the case of interchange of energy between two or more systems the energy received should be recorded as "purchased" and the energy sent out should be included with other energy sold, thus making it unnecessary to treat energy exchange separately.

For each contemplated change or addition the whole

system should be carefully surveyed to ascertain what, if any, changes in the existing equipment will have to be made to accommodate the new equipment. If a new unit is contemplated in a power house, it may be found that considerable changes in old boiler house and piping systems will have to be made to accommodate the new equipment. It may be found, for instance, that the new unit will so raise the short-circuit value that a great portion of the existing switching, not only in this one power house but also in other connected power houses and substations and even on customers' premises, will have to be thrown out and replaced by new equipment. The addition may call for a complete rehabilitation of the relay or regulating system or even the communication system. New lines may call for new synchronous condenser installations. All such matters should be carefully considered and their cost should be included as part of the estimated total investment for each year, as well as the cost per kilowatt-hour.

A separate map or diagram, or both, should be made up for each plan while it is being studied, showing the changes and additions contemplated each year for the particular plan. These plans or diagrams should be included in the report.

Whole plan can be compactly charted

It should finally be possible to reduce the whole investigation into two summary sheets, as follows (see page 780):

First Summary Sheet.—A tabulation of all plans showing what each plan contemplates adding each year, giving added generating capacity for each power house for each year of each plan, added transmssion lines, added or continued purchase contract, etc. It should also give all abandoned equipment and contracts, each year of each plan.

Secondary Summary Sheet.—In preparing the second summary sheet all plans that appear to have no merit should be disregarded and only those plans considered which appear to have some merit. For each of the latter plans the second summary sheet should give *only* the following information for each year of each plan:

1. Over-all cost per kw.-hr. delivered to load centers.
2. New capital investment.
3. Over-all plant factor of all generating stations.
4. Degree of reliability.

The degree of reliability is very often left out of consideration until the investigation is finished. It should be possible at the outset to establish in each case a degree of reliability which is a minimum condition, so that any plan that results in a lower degree of reliability would under no circumstances be acceptable. As soon as any scheme is proposed a rough map and diagram can be prepared, which would at once show the degree of reliability that the particular scheme offers.

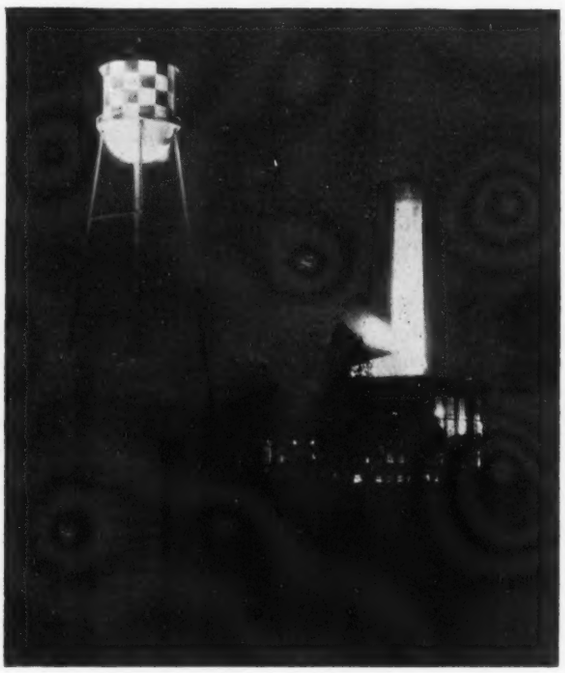
The four items listed as making up the second summary sheet would seem to be all that an executive might require. Accumulated fixed charges are important, but there are differences of opinion as to the methods of computing fixed charges or of separating them from operating charges. But the cost per kilowatt-hour delivered to load center includes all charges, and it makes very little difference whether a sub-item is a fixed charge or an operating charge.

Accumulated investments, when given as arithmetical additions, are important, but the executive must know first of all how much capital will have to be invested each year. There may be times when it is necessary to stand for a higher cost per kilowatt-hour to make large new investment unnecessary. On the other hand, there may be occasions when large investments should be made promptly and lesser investments deferred. The decisions can be made only by executives, and it is therefore important that the required investment for each year of each scheme be given in the summary.

The over-all annual plant factor is also important, because it shows at a glance to what extent the old and new equipment is expected to be utilized. If the plant factor is too low, it may be necessary to explain why it cannot be raised to such an extent as to make it possible to reduce the amount of contemplated additions. If it is too high, a careful check will be required to make sure that the high plant factor will not result in serious inconvenience. A glance at the degree of reliability on the same sheet should give an immediate answer to this question. The degree of reliability is important for another reason: the summary sheet will show at once at what cost a higher degree of reliability can be had, as regards both over-all cost per kilowatt-hour at load center and capital investment.

▼

Floodlighting Industrial Hazards to Airplanes



A 150,000-gal. water tank mounted 192 ft. above the ground and a boiler plant chimney 100 ft. high above the roof at the plants of the Pratt & Whitney Aircraft and Chance-Vought corporations, East Hartford, Conn., are floodlighted by seven 1,500-watt Crouse-Hinds units to reduce the hazard these structures offer to aviators. The tank lighting is accomplished by three units, two of which are mounted on the roof of the administration building, at the left, and one on the boiler house roof at the right, the distance from the tank being about 165 ft. The stack is lighted by four units, two of which are located on the ground and two on the boiler house roof, the spacing between units being 100 ft.

Some Flue-Gas Washers Used Abroad

By JOHN B. C. KERSHAW
Colwyn Bay, N. Wales, England

It is recognized that readers interested in removing suspended matter and corrosive gases from flue gas would like to have investment charges, operating and maintenance costs and tests proving effectiveness presented. But attempts to corral the complete story of experience with flue-gas washers abroad are not very successful. Nevertheless, these illustrated comments by a British engineer who has been studying the situation abroad may be considered another installment in a progressive report.

EUROPEAN engineers like those in America are devoting considerable time and money to investigating methods of reducing air pollution where dust firing of boilers is used. Quite a variety of methods are being tried, but the engineers are very chary about giving publicity to their fixed and operating costs. One can only assume that these costs are high and will still have to be reduced before any of these methods of cleaning and washing gases come into general use. Some of the arrangements are comparatively simple and require very little water, but they will have to be standardized so they can be applied to various furnaces before they can be put on the market at a reasonable cost. The writer believes that, for conditions on this side of the water, the combined capital and operating costs will have to be reduced to 24 cents per ton of coal consumed before a reasonable cost is obtained. Possibly we may have installations in another year or two which will better this figure.

One type of installation known as the Pfleiderer gas washer consists of a combination cyclone separator and gas washer (Fig. 1) the entire interior as well as the baffle walls of which are sprayed by 2-mm. nozzles placed 80 mm. apart in pipes over each passageway. In the original design the walls and plates were protected from the acid wash water by a lead lining, but later units were lined with hard rubber which is also acid-resisting and withstands abrasive action better. The mixture of water and suspended matter which collects in the funnel-shaped bottom is discharged into a large separating tank, where 80 per cent of the suspended matter settles before the water is discharged or recirculated.

The installation shown is used in the Badische Anilin & Soda Fabrik, Oppau, Germany, in the uptake from a powdered-fuel-fired boiler having 21,500 sq.ft. of heating surface and producing 180,000 lb. of steam per hour at 630 lb. pressure.

A film-type dust eliminator known as the Modave washer is used at the Billingham, England, works of the Imperial Chemical Company, where twenty units are installed. A large number are used in power plants in Belgium, France and Italy.

This type of washer (Fig. 2) consists of a series of vertical staggered rectangular tubes placed at right angles to the flue gas discharge. Water contained in a tank above the tubes flows into them, discharging over their upper edge so that their exterior is kept moist. Ninety per cent of the dust and 30 per cent of the sulphuric acid are said to be removed by this washer.

The water consumption of the standard size is 3 to 4 gal. per thousand cubic feet of gas, and if the wash water can be recirculated only one-third of the above quantity of water is required. The temperature drop of the gases is approximately 125 deg. F. When SO or SO_2 is present in the gases arrangements must be made for neutralizing the wash water before recirculating it. Efficiency tests with the Modave washer made at the electric power station at Auvelais, in Belgium, showed a dust recovery between 92 and 97 per cent and an absorption of sulphur acids equivalent to 70 per cent of the total present in the gas. Tests made by Rammler on an installation of the washer at the electric power

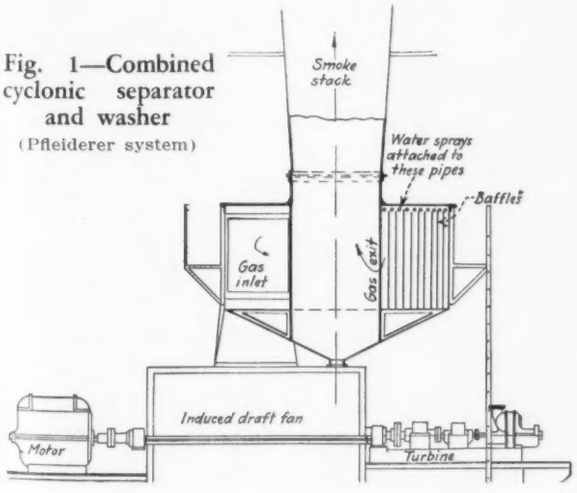
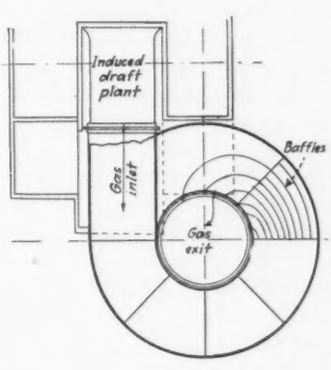


Fig. 1—Combined cyclonic separator and washer
(Pfleiderer system)



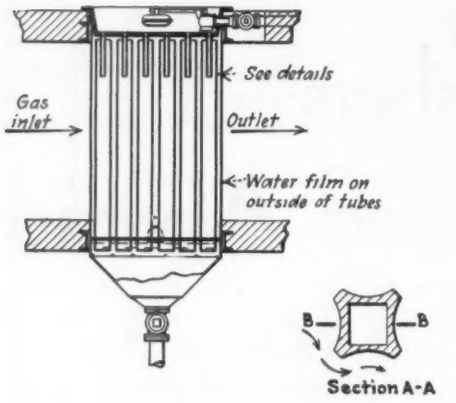


Fig. 2—Water-film flue-gas washer
(Modave system)

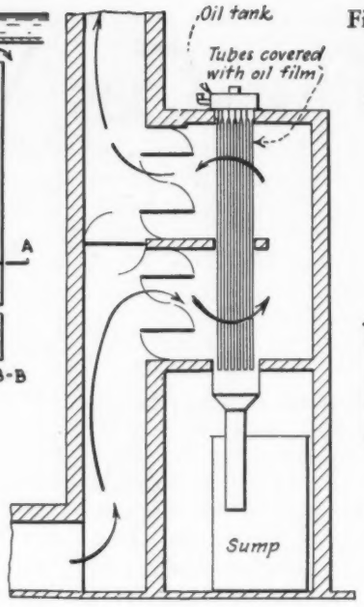


Fig. 3—Oil-film on vertical pipe collects suspended matter
(Pontaine de Bussy system)

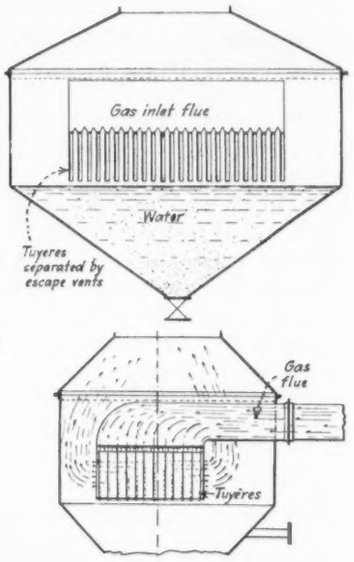


Fig. 5 — Multiple tuyères discharge near water surface
(Haveaux system)

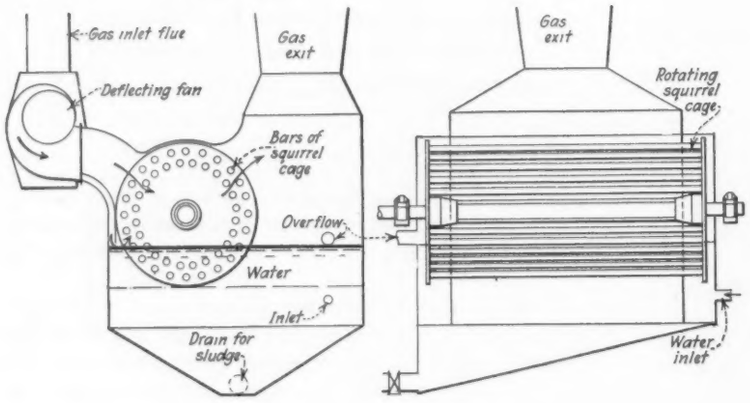


Fig. 4—Gas impinges on moistened surface of rotating squirrel cage
(Gires system)

station at Issy-les Moulineaux, near Paris, showed that 60 per cent of the ash present in the fuel burned was also present in the gases passing to the chimney, and that the Modave washer enabled 90 per cent of this ash to be caught before the gases were discharged from the stack. Table II gives the working figures for the Billingham boilers and washers. The steam-generating plant at this works is one of the largest in the United Kingdom, for it provides steam both for power generation and heating purposes.

The dry system of separating the dust by cyclonic means was not adopted because the power requirements of this system are high, and also because the fine dust still remains suspended in the exit gas. The electrostatic system of precipitation was likewise put on one side, because it required the flue gas velocity to be reduced to 3 ft. per second and the space required for installing it at Billingham would have been prohibitive. The spray systems of washing were discarded, since they entail a tendency toward choking of the ducts and chimney stacks and necessitate units being withdrawn temporarily from service.

By elimination, therefore, the film method of washing the gases was the only one left, and this was the system which has been installed. The three difficulties met with in applying it were the choking of the ducts, the erosion caused by the sand-blasting action of the dust particles and the corrosion due to the acid nature of the wash water flowing from the apparatus. Choking has been overcome by the elimination of all erratic sprays or drops of water. Erosion has been overcome by employing low velocities and corrosion has been overcome by using large quantities of the River Tees water, which is slightly alkaline. Large quantities of this water are required—as much as three to four times the quantity of steam generated—but this is taken from the discharge side of the turbine condensers and therefore the cost of water for washing was not high. In the conditions obtaining at Billingham it has been proved that the falling film method of gas washing is cheaper to install and operate than either the dry cyclone system or the electrostatic method and the actual efficiency of dust removal attained is 90 per cent and in some cases is above this figure.

Except that an oil film is used in place of a water film, the Pontaine de Bussy system (Fig. 3) is quite similar in principle to the Modave washer. A series of vertical tubes the exterior of which is kept covered by oil from an overhead tank is exposed to the passage of the flue gages and the combined oil and suspended matter is collected in a receptacle below. It is claimed that the system will remove finer particles of dust than the water film and that it can be subjected to a gas temperature of 350 deg. C. without any appreciable loss by evaporation.

The power station at Lourches, which supplies the Valenciennes-Anzin district, uses a Gires squirrel-cage washer (Fig. 4), designed by the chief engineer of the plant. A horizontal squirrel cage made up of rods of iron rotates slowly, partly submerged in a tank of water so that the flue gases always come in contact with moist-

Table I—Results of Two Tests with Pfleiderer Gas Washer

Conducted at Oppau, Germany, and lasted two hours

Speed of Waste Gases in Ft. per Second	Av. Volume of Waste Gases in Cu. Ft. per Hour		Temperature of Waste Gases, Deg. C		Recovered Wash Water in Gal. per Hour	Recovered Ash and Grit in Lb. per Hour	Efficiency Per Cent
	Before	After	Before	After			
66.9	6,742,300	4,906,700	160	42	15,356	4,000	91.9
66.9	6,742,300	5,012,600	160	49	15,290	3,571	90.1

Table II—Results of Tests with Modave Washer

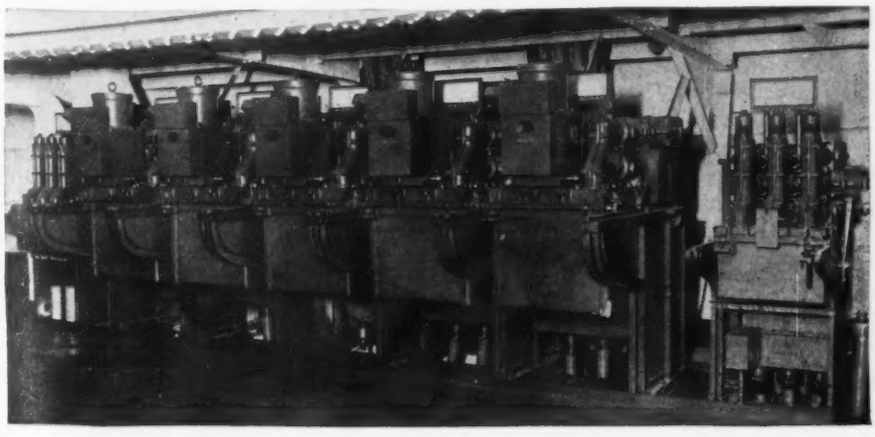
Conducted at Billingham Works of Imperial Chemical Industries, while operating five boilers with 10,020 sq.ft. of heating surface outside the 2,380 sq.ft. in the water screens and walls, and generating 1,075,000 lb. of steam per hour at 715 lb. pressure. Twelve hundred and eighty tons of coal were burned per day.

Gas Washers Number		Gas Velocity		Water Consumption	
Installed	Working	Cu. Ft. per Hour	Ft. per Second	(Gal. per Hour)	Efficiency (Per Cent)
20	10	5,130,000 to 6,850,000	8–10	325,000 to 430,000	90

ened surfaces that remove suspended matter and dissolvable gases. The water level is kept constant and the sludge drained off the bottom of the tank. The efficiency of the washer can be increased by using a fan to deflect the gases upon the surface of the water. The coarser particles of dust are removed before the gases come in contact with the moist bars of the squirrel cage. Corrosion has been overcome by covering the bars and ends of the cage with sheet lead or by using twisted strands of asbestos in place of the metal rods. These strands retain the dust particles better than the metal bars, but ought to be coated with asphalt or tar before use.

Also in use in the Lourches station is a Haveaux type of washer (Fig. 5). In this washer the flue gases are divided among many tuyères that discharge close to the surface of the water where the particles are caught before they turn through 360 deg. and escape through the passages between tuyères to the stack. The uptake from this washer has about double the area of the tuyères, so the gases expand considerably before they leave the washer, thereby reducing their velocity and aiding in the separation of solid particles. A fairly concentrated solution of sulphuric acid can be obtained before the water has to be removed for treatment. Very little moisture is carried away even when the tuyères are brought close to the water surface. It is necessary to maintain a constant level of water in the tank and the sludge must be removed at intervals from the drain.

Reyrolle switchgear with plug carriages at each end for rapid shifting of generator connections



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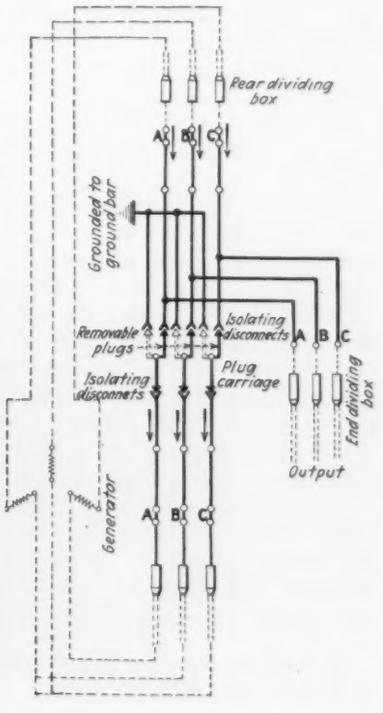
Shift Generators from Delta to Y in Five Minutes

Five minutes' adjustment of terminals on a carriage with removable plug contacts suffices to change generator connections on the floating steam power plant *Jacona* of the New England Public Service Company from delta to Y, or *vice versa*. Two 10,000-kw. turbo-alternators installed on this vessel can thus be "plugged into" shore connections at either 6.6 kv. or 11 kv. to supplement local generating facilities in times of low water in hydroelectric plants or other operating situations requiring reinforcement of power supply. Each generator is connected to a plug carriage in the switchboard room of the vessel adjacent to a set of Allis-Chalmers Reyrolle switches controlling the output of the units. The use of this type of switch saved from 40 to 50 per cent of the space required by isolated cell construction for the necessary circuit breakers and enabled full advantage to be taken of the limited headroom on the ship.

In changing from delta to Y it is only necessary to shift the three removable plugs on the carriage from one set of receptacles to another, thus grounding the terminals of the generator stator windings. Returning the plugs to the original set of receptacles breaks the ground connections and re-establishes the delta. The Allis-Chalmers company designed the plug carriages, which are electrically interlocked to prevent premature opening or closing.

Wiring scheme of plug carriage

Solid-drawn plugs show set-up for delta connection, dash-lined plugs for Y arrangement.



Factors Affecting Steel Weldability*

By W. E. STINE

Research Engineer
Lincoln Electric Company, Cleveland, Ohio

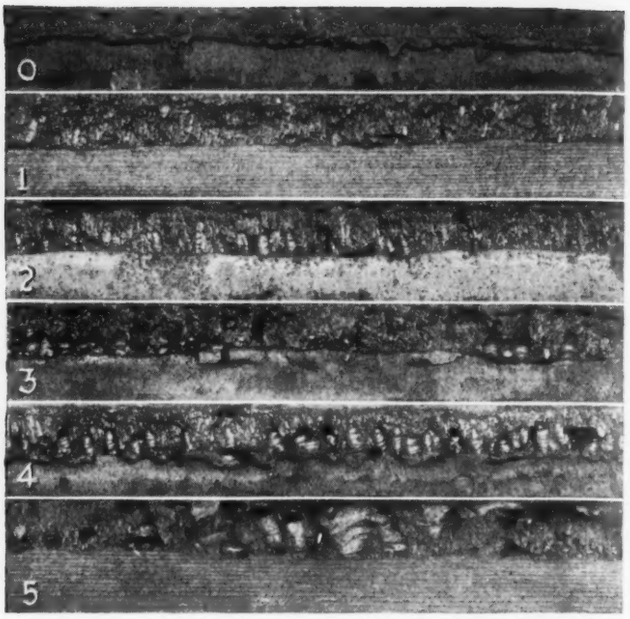


Fig. 1—Welds with different degrees of porosity

Standard samples of porous welds, ranging from 0, free from porosity visible to the naked eye, to 5, a heavily porous weld.

IN THE endeavor to eliminate unsatisfactory electric welds of steel which have arisen from time to time despite the use of first-class technique in the handling of equipment and the application of proper currents, the research department of the Lincoln Electric Company investigated the effect of the chemical constituents of steel upon welding results and porosity in particular. Carbon arc welding with a shielded arc offered the best means of studying the problem. The investigation was largely confined to determining the causes of slag holes and gas holes, since the causes of cracks are reasonably well understood. The study showed (1) that non-metallic inclusions such as aluminum oxides having their melting points between the melting point and the boiling point of steel will cause slag holes or pits in the weld metal of electric-arc-welded steel, unless fluxed with some other material which lowers their freezing point below that of the steel, and (2) that aluminum, silicon, manganese or any other deoxidizers having gas solvent properties which are present in excess of the quantity necessary for chemical equilibrium with the oxygen present in the steel at a temperature slightly above the temperature of solidification may cause the formation of gas holes in the weld metal. Gas holes are not formed in any considerable number where the arc is formed in an oxidizing atmosphere. The weld metal in such cases is over-oxidized, has very little ductility and will not be a high-quality weld. High-quality arc welds can be made only with a shielded arc, as by burning an impregnated fibrous autogenizer fed through the arc at a constant rate.

Standard samples of porous welds were chosen for comparison. Steel manufacturers co-operated in furnishing different samples for testing. The first series of samples was made by taking very low-carbon, low-manganese steel and melting it in an electric furnace, adding various desired amounts of carbon and manganese. This steel was then rolled into plates and welded. All samples in this group proved to be poor welding quality. Subsequent tests and analysis indicated that the steel used as a basis for this series of samples had been deoxidized with an excess amount of aluminum and that the aluminum was the principal controlling factor.

It was found that steel which formed slag holes in the weld, as shown in Fig. 2, invariably had been aluminum-killed and contained an appreciable amount of Al_2O_3. This characteristic was checked by covering a piece of good welding steel with a thin layer of Al_2O_3 before welding it. The result was very similar to that shown in Fig. 2. In order to determine whether this characteristic is a matter of melting temperature of the inclusions, a similar test was made with chromite, which has about the same melting temperature (2,050 deg. C.) as Al_2O_3. The result was almost identical.

Analyses of Typical Test Welds

Sample No.	101	1020	1021	1015	1016	1045	1050
Steel maker	A	B	B	C	C	B	B
Furnace	O.H.	O.H.	O.H.	O.H.	O.H.	O.H.	O.H.
Recarbonized	Yes	Yes	Yes	No	No	Yes	Yes
Deoxidizer furnace	.....	.....	.....	Spg.*	Spg.*	.....	.....
Deoxidizer ladle	Mn	Mn	Mn,Si	Mn	Mn	Mn	Mn,Si
Deoxidizer mold	No	No	Al	Al	No	.....	No
Aluminum oz./ton	0	0	1.5	.....	0	.....	0
Analysis C	0.20	0.19	0.21	0.14	0.14	0.48	0.51
Analysis Mn	0.44	0.60	0.52	0.75	0.75	0.74	0.59
Analysis S	0.029	0.027	0.034	0.111	0.111	.....	0.035
Analysis P	0.016	0.018	0.020	0.016	0.016	.....	0.025
Analysis Si	0.02	0.02	0.07	0.012	0.012	0.20	0.08
Analysis Cu	0.03	.....	.....	.....	.....	.....	.....
Analysis Al	.....	.....	0.005	0.116	0.014	.....	.....
Analysis Ni	0.02	.....	.....	.....	.....	.....	.....
Size, thickness	¼	¼	¼	¼	¼	¼	¼
Welding amp	300	300	300	300	300	300	300
Welding volts	38	38	38	38	38	38	38
Welding speed, in./min.	15	15	15	15	15	15	15
Porosity	0	1–2	3	4–5	1–2	5	1
Appearance	Good	Good	Good	Poor	Good	Poor	Good

*Spiegeleisen.

**From a paper presented at the fall meeting of the American Welding Society at Boston, Mass.*

It is somewhat apparent that the behavior of the metal when being melted under the electric arc during the arc-welding process is different from its behavior when it is melted in the furnace preparatory to being made into castings. It is believed that this difference is because of the higher temperature and relatively greater area exposed during arc welding.

It is evident that these slag holes or depressions are caused by non-metallic inclusions in the steel which remained as finely divided solid inclusions during the steel-making process, but during the arc-welding process melted and coalesced to form large globules that solidified ahead of the steel and formed holes or pits in the weld metal. These holes can be eliminated by using a slag-forming flux of low melting temperature which will combine with slag of the steel, forming a new slag having its melting temperature below that of the steel.

Steel may hold certain gases such as hydrogen and nitrogen in solution at room temperature. Carbon monoxide and carbon dioxide may be produced in steel at elevated temperatures as a result of chemical reaction between the carbon of the steel and oxygen in the form of oxides contained in the steel. Gases also may be absorbed from the surrounding atmosphere by the molten metal while it is being welded.

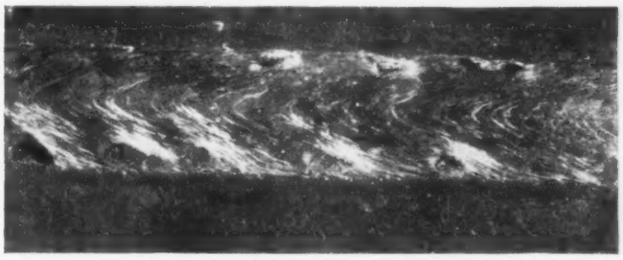


Fig. 2—Slag holes due to high aluminum oxide content

Weld in steel of analysis: C, 0.118 per cent; Si, 0.024 per cent; Mn, 0.47 per cent; Al_2O_3, 0.03 cent.

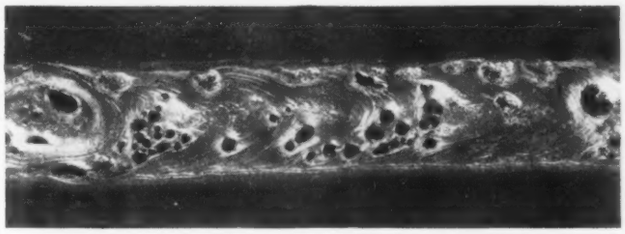


Fig. 3—Poor weld due to high aluminum content

Steel weld, analysis: C, 0.118 per cent; Si, 0.02 per cent; S, 0.112 per cent; P, 0.01 per cent; Mn, 0.68 per cent; Al, 0.116 per cent.

Fig. 4—Poor weld due to high silicon content

Steel weld, analysis: C, 0.32 per cent; Si, 0.31 per cent; S, 0.026 per cent; P, 0.021 per cent; Mn, 0.73 per cent.

Fig. 5—Effects of flux and gas absorption

Steel weld, analysis: C, 0.09 per cent; P, 0.016 per cent; S, 0.03 per cent; Mn, 0.41 per cent. A slag-forming flux was used on half the plate, the other half showing holes produced by gases absorbed during welding.

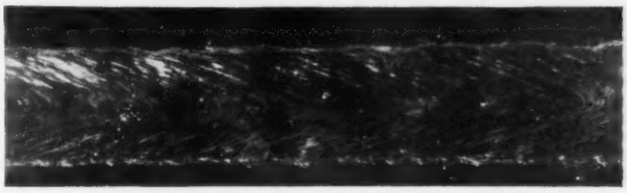


Fig. 6—Example of good welding steel

Analysis, C, 0.20 per cent; Si, 0.021 per cent; sulphur, 0.029 per cent; P, 0.016 per cent; Mn, 0.44 per cent.

It is well established that the capacity of liquid steel for holding gases in solution is much greater than that of solid steel. The gases held in solution by the solid steel will not cause the formation of gas holes when being welded, if one can prevent the further absorption of gases by the liquid steel and the formation of gases by chemical reaction without decreasing the capacity of the steel to hold gases in solution.

It has been fairly well established that the capacity of steel for holding gases in solution varies directly with temperature and the content of aluminum, silicon and manganese and inversely with the carbon content.

If the capacity of the steel for holding gases in solution is to be maintained at ingot mold value, the aluminum, silicon or manganese must not be oxidized out during welding to any appreciable extent. To prevent the rapid absorption of gases at the high welding temperatures, the content of aluminum, silicon and manganese should be as low as practicable.

The oxidation of carbon during welding is permissible, but this reaction should cease before solidification of the weld metal begins. Chemical equilibrium should be reached between the carbon and the oxygen in the steel at a temperature slightly above the temperature of solidification, and at least one deoxidizing element (aluminum, silicon or manganese) should be present in an amount which will also be in approximate chemical equilibrium with the oxygen present in the steel at a temperature slightly above the temperature of solidification.

Under this ideal condition a steel of given carbon content will have a minimum capacity for absorbing gases at the high welding temperateure. Its capacity will increase as the carbon is oxidized out. The formation of carbon monoxide will cease before the metal solidifies

and there will be a minimum change in the amount of gas solvent elements such as manganese, silicon or aluminum. Such a steel should therefore have the best arc-welding characteristics.

The results of the tests seem to verify the theory set forth above. An excess of aluminum, silicon or manganese is capable of causing gas holes in the weld metal, the effect of manganese being least pronounced. It was also found that the weld metal in dead soft steel may be porous, owing to gas holes, unless a slag-forming flux is used to cover the weld metal while it is molten.

Fig. 5 shows such a weld, one-half of which was made without the use of a slag-forming flux. As previously pointed out, a very low-carbon steel has a high capacity for gases at high temperature, and since there is no appreciable carbon in the steel to be oxidized, the capacity of the steel to hold gases in solution does not increase during welding. Consequently the steel absorbs gases in excess of the saturation of the solid steel and some gases are given off during solidification, forming gas holes. The formation of these holes can be prevented by the use of the proper fluxing material.

It is evident that the proper control of aluminum in steel plates, sheets, filler rods or electrodes for welding should be left to the steel maker. The inaccuracy of an analytical determination of aluminum makes it impracticable to include limits for aluminum in steel specifications. However, the deleterious effect of a slight excess of aluminum is so great that it must be carefully controlled in the manufacture of steel for electric arc welding. Permissible tolerances have not been accurately determined, but the data indicate that the following approximate tolerances may be used: Manganese, plus or minus 0.10 per cent; silicon, plus or minus 0.015 per cent; aluminum, plus or minus 0.01 per cent.

In most cases satisfactory welds can be obtained in welding steel plates which are not in themselves of good welding-quality steel by the use of the proper fluxing material, filling or electrode material. The best results can only be obtained, however, when the steel to be welded is of good electric arc-welding quality.

Other things being equal, the tendency for gas holes to form increases with the speed of welding. As arc-welding speeds are being stepped up the importance of the proper quality of arc welding steel for plates, filler rods and electrode material becomes increasingly important.

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Forgetfulness Need Not Impair Plant Safety

Buildings are widely scattered and cover large areas at the Paterson (N. J.) plant of the Textile Dyeing & Printing Company of America. The finished material and that in process are of unusual value. To guard against the perils that go with darkness and lack of protection the management of this plant decided to insure the turning on and off of night lights and yard lights at a definite hour, free from failures due to human fallibility.

The arrangement devised consists of an astronomical time switch. Its action is definitely predeterminable for long intervals, and it acts upon a master circuit on the main substation switchboard to control through relays the operation of local circuits for plant and yard lights at various control points.

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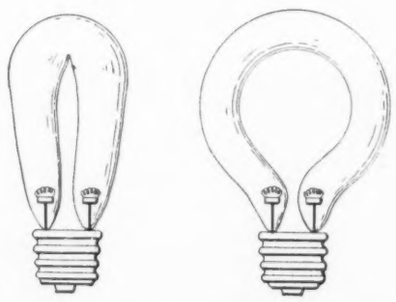
Bright, Cold-Cathode Lamp for 110-Volt Service

In Germany and England a new type of electric lamp has made its appearance which, according to *Electronics*, is believed to mark an important development in the art of illumination. It is a cold-cathode gaseous lamp which combines the advantages of the mercury-vapor lamp and of the neon tube and which can be connected directly with any 110-volt socket. The inventors, Dr. H. J. Spanner, Edmund Germer and U. W. Doring, arrived



Two forms of gaseous discharge lamp for standard socket use

in this country recently to demonstrate their new lamp, which is already being introduced into Europe by the Philips and Osram companies, which have purchased the rights there.

"What is wanted in the illuminant of the future," Dr. Spanner is quoted as saying, "is a lamp which will have all the advantages of mercury and neon lamps, which can be made to glow with any color, even if the desired color is an approximation of daylight, and which can be screwed directly into any socket."

The Spanner-Gerner-Doring lamp, it is said, can be made not only in the usual long tube or in the intricate designs required to reproduce the effect of luminous handwriting, but also in the form of tubes curved back on themselves to produce a "bulb" which can be screwed into any household socket—something not possible before. Moreover, mercury can be mixed with any desired element to produce light of almost any color. Thus a mixture of the vapors of mercury, zinc and sodium gives a light much like daylight. Cadmium gives a bluish light tinged with a little red. Such mixing of elements is not broadly new, but the flexibility is enormously increased, with no marked loss in efficiency.

The new lamps are declared to be three to five times more efficient than the best filament-type incandescent electric lamps, which means that for the same amount of current three to five times as much light is obtained. They operate on 110 volts, a.c. or d.c.

Adequacy of house wiring is something every one in the electrical industry has recognized is essential if the domestic market is to be developed to the extent which many believe it can be. But few specific suggestions have been given heretofore on what constitutes adequacy. Each person has been left to interpret the term as it impresses him personally.

Now that the Association of Electragists, International, has presented what it considers adequacy to mean, the industry has something to hew to. Whether the electragist's conception is correct or not does not matter so much. Their recommendations open up a greatly increased field of activity for electragists and manufacturers. If applied, they will greatly facilitate the sale of all domestic appliances. And utilities will be relieved of the major bottle neck to increased domestic usage of service.

The major characteristic of the recommendations is that each one has some definite benefit to the user to justify its application — convenience of use, convenience of control or convenience in extending utilization of electric service.

Electragists Recommend Essentials of Adequate House Wiring*

BELIEVING that a real need exists among electrical contractors, architects, engineers and building owners for an authoritative guide to best practice in wiring installations, the Association of Electragists, International, in 1926 appointed a special committee to undertake the preparation of such a guide, to be known as the Electragist Standards for Wiring Installations.

In determining what constitutes best practice, the considerations involved are those of safety to life and property, permanency, adequacy, efficiency and economy of operation, with proper regard for cost. Safety to life and property must always be assured. The degree of permanency and adequacy and the cost of the installation must in every case be commensurate with the character of the building structure, the character of the occupancy of the building and the character of the service to be provided by the wiring installation.

"Best practice" must not be assumed to mean the most costly wiring installation in every case; the end to be sought is an installation having a sound investment value. Certain conditions exist which call for comparatively inexpensive wiring installations; in some few instances the conditions dictate the use of materials and types of wiring which are of the highest quality obtainable at any price; while in the great majority of installations the proper balance between cost and true value is secured by employing materials and installation methods which are by no means the cheapest but at the same time are not the most costly, and by engineering design which provides adequacy without waste or extravagance.

The recommendations, with some deletions necessary because of space considerations, follow:

General—Three-way switches should be installed to control lighting outlets at head and foot of stairways between active floors. Each outlet should have separate control, which will require two three-way switches for each outlet. Three-way switch control should also be provided for one outlet, usually the ceiling outlet, in each room or hall having two or more main entrances which are more than 10 ft. apart, one switch to be located near to each main entrance. Except for the outlet for the washer at the laundry trays, all convenience outlets should be of the duplex type.

Entrances and Porches—(a) At least one ceiling or bracket outlet should be installed outside each principal entrance, each such outlet to be controlled by a switch just inside the door.

(b) For covered porches additional ceiling or bracket outlets should be provided so that there will be at least one outlet for each 100 sq.ft. of floor area. All such

*Excerpts from recommendations of Association of Electragists' standards committee, just recently presented at the annual convention in Hot Springs, Ark.

outlets should be controlled by one or more switches located inside the house.

(c) One convenience outlet should be provided for decorative lighting at the front entrance controlled by a switch inside the house.

(d) Convenience outlets should be installed on porches so as to provide one outlet for each 15 ft. of wall space on the house side. Such outlets should be installed high enough above the floor to be shielded from the weather.

Halls, Passages and Stairways—In every hall or passage at least one ceiling bracket outlet should be installed and outlets should be so located as to illuminate the head and foot of every stairway. Additional outlets should be installed in halls and passages to provide at least one for every 15 ft. of length. All such outlets should be controlled by switches as provided in the paragraph headed *General*. Three-way switch control should be provided in a hall more than 10 ft. long, one switch to be located at each main entrance.

At least one convenience outlet should be provided for every 12 ft. of length of a hall or passage. A convenience outlet will be needed at a point where a public telephone is to be installed and outlets should be available for connection of a vacuum cleaner and floor polisher.

Living Room, Bedrooms, Reception Hall, Library, Den, Sun Room and Other Similar Rooms—A ceiling outlet should be provided for each such room even though no ceiling fixture is contemplated for immediate use. In rooms having a total floor area of 300 sq.ft. or more and whose length is more than 1½ times the width, two ceiling outlets should be provided; each ceiling outlet should be controlled by a separate switch.

Convenience outlets should be provided so that no point in any unbroken wall space is more than 6 ft. from an outlet. At least one convenience outlet should be provided in every wall space 3 ft. or more in length.

Dining Room, Breakfast Room, Breakfast Nook—Except where some special form of lighting is to be used, a ceiling outlet should be installed in each of these rooms, to be controlled by one or more switches.

In any room having a floor area of more than 100 sq.ft., a minimum of two convenience outlets should be installed, with additional outlets so as to provide at least one in every wall space which is adaptable to the use of a buffet, serving table or similar pieces of furniture. The floor outlet, when used, may be considered as one of the recommended minimum of two outlets. In rooms having less than 100 sq.ft. of area and where the dining table will be set against the wall one convenience outlet at table height will usually be sufficient.

Kitchen, Kitchenette and Pantry—One center ceiling outlet should be provided with switch control. Supplementary outlets should be installed to provide local lighting over the range, sink and other work area. Where bracket outlets are specified for supplementary lighting the fixtures should preferably be of porcelain. Where drop cords are necessary it is recommended that rubber-sheathed cord (type SJ) be used.

A convenience outlet should be provided at the sink, adjacent to the ironing board and adjacent to each other work area. Care should be taken to provide outlets conveniently located for the connection of a refrigerator, dish washer, ventilating fan, flat iron, electric clock and equipment designed for use on a work table.

Laundry—Ceiling outlets should be provided over trays and over the ironer location. Both of these outlets may be controlled by one switch.

An outlet for a washing machine should be provided on the ceiling in front of the trays; this outlet should be equipped with suitable length of rubber-sheathed cord (type SJ) terminating in a cord connector. A convenience outlet should be provided on the wall for connection to the ironer; this outlet should be equipped with a pilot lamp, which will be lighted when the cord is inserted. Provision should be made for grounding the frames of the washer and the ironer by installing in each case a three-pole polarity type receptacle with one pole properly grounded to the conduit or to the armor of armored cable, or where open wiring or non-metallic sheathed cable is used a separate ground wire should be run to the nearest water pipe.

Basement—Any finished room in a basement should be equipped according to the general recommendations for a room of such type.

A ceiling outlet should be provided in each inclosed space, also one or more ceiling outlets as may be necessary to provide light at the stairway, in front of the furnace and at a workbench. The outlets at the foot of the stairs and at the furnace should be controlled by a switch at the head of the stairway to the basement and this switch should be provided with a pilot light to indicate when the basement lights are burning.

One convenience outlet should be provided at a suitable location for a workbench.

Bathrooms—One bracket outlet should be provided on each side of the mirror, and in bathrooms having a floor area of 90 sq.ft. or more a ceiling outlet should be provided. One switch should be provided to control the bracket outlets and one switch to control the ceiling outlet, these switches to be located near the door.

Where permitted by the local ordinance, it is recommended that one convenience outlet be installed; this to be located as far as possible from the tub and at a height of about 40 in. above the floor. A plug receptacle which is an integral part of a porcelain bracket fixture is considered satisfactory.

A built-in air-heater should be installed in each bathroom. The minimum capacity required will be 1,500 watts and a separate circuit should be installed to supply this heater.

It is recommended that all metal lighting fixtures which are within reach should be grounded, also that exposed metal parts of the heater and metal switch and receptacle plates should be grounded.

Closets—Except in a wardrobe or linen closet, one bracket outlet should be installed immediately over the door.

Attic—In an unfinished attic one ceiling outlet should be installed in each inclosed space. One such outlet, suitably located, should be controlled by a switch at the foot of the stairway to the attic. Where there are one or more finished rooms in an attic three-way switch control should be provided as previously recommended.

Garage—For a one- or two-car garage it is recommended that one ceiling outlet be installed located at a point about 5 ft. from the rear wall. An outlet for an outside light should be provided on a detached garage, this outlet and the inside ceiling outlet to be controlled by two three-way switches, one to be located in the

garage and one in the kitchen or other suitable location in the house.

One convenience outlet should be provided on the rear wall, also one convenience outlet at a space, if any, provided for a workbench.

Where practicable, it is desirable that all garage outlets be supplied by a separate circuit. Such separate circuit should always be provided in a cold climate where it is probable that electric heaters will be used.

Additional suggestions on outlets and switch control

Living Room, Dining Room and Kitchen—In these rooms, also in some other rooms, it will frequently be found desirable to provide three-way switch control for the ceiling outlet, even where the main entrances in such rooms are less than 10 ft. apart.

Kitchen—It is desirable to provide one switch to control all outlets for supplementary local lighting. A convenience outlet adjacent to an ironing board or any other outlet intended specifically for the connection of a flat iron should be provided with a pilot lamp which will light when the cord is inserted.

Closets—The lighting outlet in a closet may be controlled by a door switch which automatically turns the light on when the door is opened and turns the light off when the door is closed.

Protective Lighting—It is often found desirable to install outlets on the outside of the house so located as to light the rear of the premises. In most cases such lighting can be accomplished by means of two suitable fixtures installed at the rear corners of the house immediately under the eaves. Such lighting should be controlled at a suitable location on the first floor and in the owner's bedroom.

Special Form of Convenience Outlet—Where switch control of convenience outlets is provided it may be desirable to make use of a special type of duplex receptacle which is so made that one of the receptacles may be connected to the switched circuit while the other receptacle is not controlled by the switch. Each floor or table lamp or appliance may then be connected at will so that it is controlled by the switch or is only under local control.

Bedrooms—It may be found convenient in certain bedrooms to provide three-way control of the ceiling outlet, one switch to be located at the door and one to be located near the bed.

Burglar Switch—As a protection against burglars, an arrangement may be provided whereby a switch in the owner's bedroom will turn on at least one lamp in every principal room in the house. After so being turned on these lights cannot be turned off except from the same point. This arrangement, however, does not in any way interfere with the local control of the lights for ordinary use.

Branch circuits for lighting and portable appliances

No house can be considered as adequately wired unless branch circuit capacity is provided for the probable maximum use of electrical energy in the house. It is therefore desirable that the number of branch circuits installed in a house should be made dependent entirely upon the size and other features of the house itself, rather than upon the number of outlets which the owner or the builder may see fit to install at the time when the house is built. By providing ample capacity for the house in the circuit wiring, additional outlets may be installed at any time, either before the completion of the original work or at some later date, without any expense for additional circuits.

In every house use of the heavier portable appliances is largely confined to the kitchen, dining room, pantry, breakfast room and laundry. It is therefore recommended that all convenience outlets in the kitchen, pantry, dining room and breakfast room be supplied by one special appliance branch circuit, and that where there is any room or space intended for use as a laundry one special appliance circuit be installed to supply convenience outlets in such room.

For all lighting in the entire house and for the supply of such appliances as are commonly used elsewhere than in the kitchen, dining room and laundry one branch circuit should be installed for each 500 sq.ft. of floor area; this is equivalent to an allowance of 2 watts per square foot with 1,000 watts per circuit. The total number of outlets should be divided with approximate equality between the number of circuits required by this rule. In the house provided with an adequate number of outlets this will usually result in the installation of fifteen or twenty outlets on each circuit.

It is further recommended that no circuit be confined to any one room, but that each circuit be so laid out as to supply outlets in two or more rooms; where this is done the total wattage in one room might exceed 2 watts per square foot, but almost invariably the wattage in the other rooms supplied by the same circuit will be considerably less.

Circuits for fixed appliances

If an oil burner, automatic stoker or similar device is to be installed for immediate use a circuit should be installed complete to suitable points for connection to the apparatus. The average power requirements for an ordinary oil burner are one $\frac{1}{4}$-hp. and one $\frac{1}{6}$-hp. motor. Under the National Electrical Code rules these two motors may be supplied by one branch circuit of No. 10 wire fused at 25 amp., if the motors operate at 110 volts.

If an oil burner or stoker is not to be installed for immediate use circuit protective devices should be provided, but it is only necessary to provide means for bringing the circuit to the distribution center.

Where the local conditions permit the economical use of electric ranges, water heaters and other high-capacity appliances the following recommendations apply:

Electric Range—Branch circuit fuses or a circuit breaker should be installed, and where the immediate installation of a range is contemplated the range circuit should be installed complete. In most cases the maximum capacity to be provided for a range is 7,500 watts for single-family dwellings, though in some localities larger ranges are commonly installed. For a 7,500-watt range the conductors cannot be smaller than No. 8, and it is recommended that No. 8 conductors be installed for ranges not exceeding this capacity where the total length of the circuit from the distribution center to the range does not exceed 50 ft. For larger ranges No. 6 conductors must be employed in order to provide sufficient carrying capacity, and for a 7,500-watt range, where the total circuit length exceeds 50 ft., it is recom-

mended that No. 6 conductors be employed in order to keep the voltage drop within desirable limits.

Water Heater—Branch circuit fuses or a circuit breaker should be provided for a circuit to an electric water heater and where the immediate installation of a water heater is contemplated the circuit should be installed complete. The rated capacity of the water heater will seldom be less than 1,500 watts, and the capacity which should be provided for will vary from this minimum to a maximum of about 5,000 watts, depending upon the local conditions; a 220-volt, two-wire circuit will usually be employed.

Since the number of outlets installed in a given house is variable and depends more or less upon the individual preferences of the owner or builder, this item should be disregarded in determining the service capacity and the capacity should be determined upon the basis of the characteristics of the house itself.

The following recommendations will provide ample service capacity in every case: Allow 2 watts per square foot for the first 2,000 sq.ft. of floor area, plus 1 watt per square foot for that part of the total area in excess of 2,000 sq.ft., plus 1,000 watts. To the total wattage thus computed add the rated capacity of all fixed appliances. The total wattage thus arrived at is to be considered as the required capacity for the service conductors and main service switch.

Where both an electric range and electric water heater are installed and the water heater is so controlled as to constitute an off-peak load, the wattage consumed by the water heater may be neglected in computing the service capacity.

Where in addition to a range and water heater two or more fixed appliances are installed having an aggregate rated capacity of 3,000 watts or more a demand factor of 70 per cent may be applied to the fixed appliance load, provided that the range capacity shall be considered as not less than 7,500 watts.

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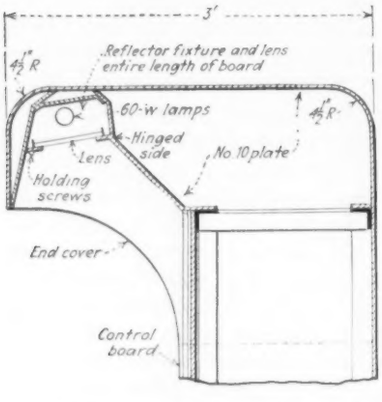
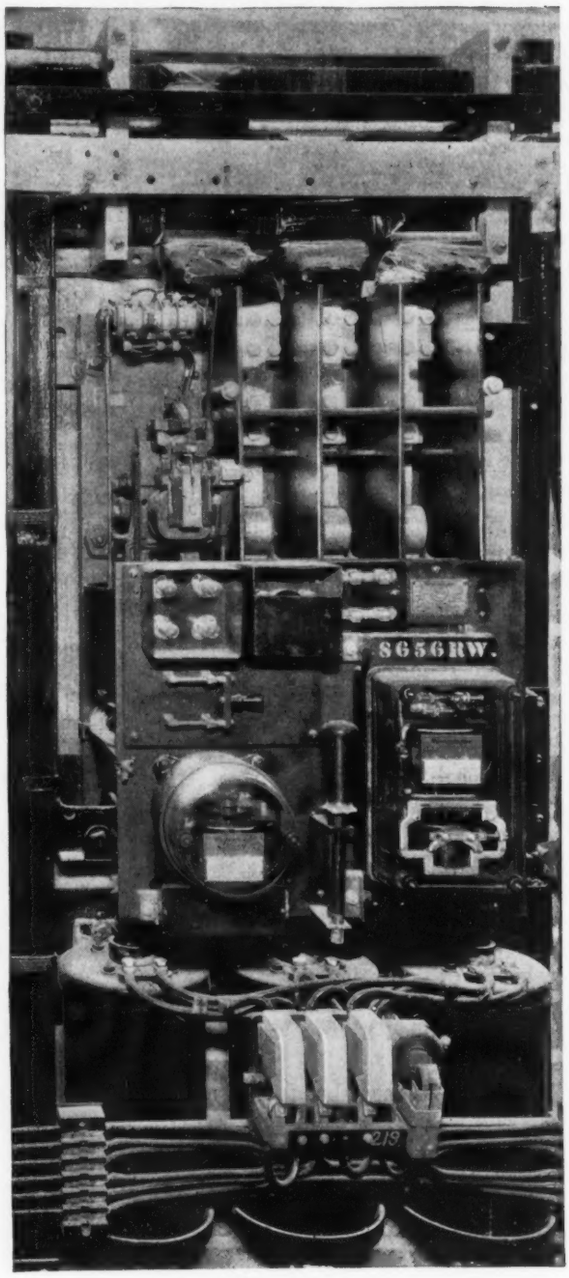
Hooded Reflector Trough Lights Control Board



Illumination of the boiler control boards in the Harding Street station of the Indianapolis Power & Light Company is afforded by a trough reflector concealed by an overhanging hood along the top of the board. The ends of the hood are closed with plates that extend downward far enough to cut off the light where it is not needed. The hood has a certain value of protection to the board from falling objects and gives a much more finished appearance than lighting units on bare brackets.

Network Units for Interior Distribution



Open units in vault area
One of five secondary network units on 84th floor. Taped fuses with neutral bare.

Ordinary network switch units are used in the Empire State Building, just opened for occupancy in New York, to control the distribution circuits from the various levels. There is one of these switch units for each bank of transformers connected through a link fuse to the service bus in each transformer vault. The units on the 41st floor were inclosed with metal doors. On the 84th floor the units were installed in the vault area and inclosure was not provided. The three phase-conductors were taped, but the grounded neutral conductor was left bare.

READERS' FORUM

Getting the Most from the Staff

To the Editor of the ELECTRICAL WORLD:

Professional men and men in the higher grades of technical work have what may be called scientific rather than acquisitive minds; it is not usually merely a matter of money, they take a professional pride in their work, they belong to professional institutes, they want respect and appreciation not only from their employers but also from their professional brethern. This is an entirely natural and unquenchable desire and no educated and ambitious man will be satisfied in his mind if he feels that he is doing first-class work year after year and that no one knows anything about it except the chief.

If, on the other hand, his name is attached to his work or publicly mentioned in connection therewith, the position becomes quite different; his professional acquaintances refer to it, he feels that his work is receiving recognition, that he is building up his reputation, that his future prospects are strengthening; he is uplifted and encouraged, he thinks of his chief: "Oh! well, if he is going to treat me like this——" and he plunges into the next job with unlimited enthusiasm.

Whole-hearted service is immeasurably more valuable than ordinary service; it can be secured by very high pay, but it can also be secured by moderate pay plus treatment that makes a man feel that he is earning respect and making headway. No one imagines that a chief does all the important work himself, and least of all, the directors and experts of similar undertakings or concerns. The thought inevitably springs to their minds: "I wonder who did this for him?" If a particular matter is not the chief's personal work he should be content to receive credit for the administrative and executive qualities that secured it. There is no higher quality in any executive than the power to select and hold men of ability and it increases public confidence to know that a concern employs such men, but how is the public to know it if the men are kept in the background?

Often a chief winds up his annual report with a more or less glowing reference to the valuable work of his staff in general, but mentions no individual by name. The thought may be that this clears him of "hogging" the credit himself, but what good does it do to any one? There will doubtless be some unsatisfactory members of his staff, but he does not withhold the general statement for that reason, and of the most valuable members not one will feel anything but a certain soreness at being lumped in with the rest; not one will feel elated or encouraged.

A certain widely known manager is well remembered to have pursued exactly the other course; he never missed an opportunity to give well-merited praise verbally, in writing or in print. He could not, of course, mention all, but all saw that he was generous and fair, and he received the most enthusiastic co-operation and loyalty. His department turned out such quantities of high-class work that it attracted attention in high quarters, he got credit for his administrative ability; he advanced to the limit and then he left to accept about twice as high a remuneration in another concern, and now, after many years, he is never spoken of by any one who worked under him without respect and admiration.

To make open acknowledgment of the outstanding work of an employee can do nothing but good; for the manager it indicates his self-confidence, judgment and broadmindedness; for the rest of the staff, each one sees that merit will be not merely recognized but acknowledged and each will be encouraged to further efforts in the hope that it will be his turn next.

FROM A READER.

[Unsigned letters lack the convincing qualities of comments from men whose occupations are made known to the reader, but to place a ban on all comments which cannot be signed would prevent the dissemination of ideas that may have merit. Consequently, the editors are using their judgment in occasionally publishing opinions which cannot be identified.—EDITOR.]

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Miniature Control Switch Varies from Conventional Type

To the Editor of the ELECTRICAL WORLD:

In a news item in the July 18 issue you inadvertently showed a telephone type control switch as representing the new Westinghouse miniature control switch. Three unusually novel design features of the Westinghouse minatrol mark it as a radical departure from conventional control switch design and warrant further illustration of this switch.

These features are, briefly, the use of toggle switches for quick make-and-break action, giving excellent performance, capacity and dependability; attractive faceplate of stainless steel and operating key of black molded material, of blended figure design, harmonizing with the best expressions of contemporary art, and complete factory assembly of switch, operating key, and faceplate, requiring no disassembly for switchboard mounting, and employing an unusual method of exposing the mounting screws where necessary and concealing them when panel mounting is completed.

These new control switches will handle circuit-breaker controls, rheostat controls, speed controls and similar functions at full rated voltage and current, obviating the former use of intermediate control voltages and relays. They undoubtedly mark the advance of modern switchboard design.

A. J. A. PETERSON.

Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

BOOK REVIEWS

Television, Its Methods and Uses

By Edgar H. Felix. McGraw-Hill Book Company, New York. 272 pages. Price, $2.50.

Now that the glamor of radio broadcasting has abdicated to commercialized contentment the expectant public yearns for the immediate realization of popularized television. Technical obstacles are yielding to research, but many formidable ones remain to delay perfection. Those who are more intent on getting an intelligent, comprehensive and readily understandable view of these handicaps than in finding out how to make amateur sets will read this book. They will sense the limitations to scanning detail, the problem of illuminating the object, the restraint of limited broadcast channels, the impediments imposed in reception, difficulties in synchronization. They will also learn the criteria of acceptable radio television and the potentialities the whole institution has for entertainment and commercial service. The book is in no sense pessimistic about the future of television.

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Technical Writing

By T. A. Rickard. John Wiley and Sons, Inc., New York. Third edition, 337 pages. Price, $2.

This well-known book has been revised by its author and has been improved greatly by new citations of good English. No more concise and interesting book exists that treats of the subject so well. It is professional instead of academic and is enriched by human interest values.

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Vector Representation for Electrical Metermen

By D. T. Canfield. McGraw-Hill Book Company, Inc., New York. 176 pages. Price, $2.

Metermen attending short courses have invariably asked, "Is there a good elementary text dealing exclusively with vectors?" Professor Canfield has answered the metermen's prayer and in such a way as to be of help to any one desiring to enter vector circles through primary doors. Polyphase systems are elucidated, power and reactive measurement in them explained vectorially and power-factor problems discussed. There are problems with each chapter and an appendix explaining trigonometric functions.

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A Picture of World Economic Conditions at the Beginning of 1931

Published by National Industrial Conference Board, Inc., 247 Park Avenue, New York. 349 pages. Price, $3.

The purpose and contents of this volume are well described in the preface, as follows: "It gives a carefully summarized analysis of those contemporary facts regarding industrial production, wages, prices, employment, foreign trade, public and private finance, and other important economic factors that give to each country its special importance in the economic commonwealth of nations. The major currents of world economy are here interpreted from the American point of view."

This applies particularly to the first part of the book. As a counterpoise to that American point of view, the second part consists of original articles, especially prepared by distinguished foreign authorities, thus affording the reader an insight into the foreign views as seen from within the respective countries.

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Recent N.E.L.A. Committee Reports

Turbines (Prime Movers, No. 151. $1.50 to non-members). This report includes the 1930 operating records of 324 large turbines, ten turbines operating above 1,000 lb. steam pressure and tests on five turbines ranging from 65,000 to 165,000 kw. capacity. Operating companies' statements on the fouling of turbine buckets are included. The 1930 operating reports subdivide units into years of service—one to seventeen years—and show the capacity use, operating time, service demand availability factor and relative time elapsed for condenser, turbine and generator outage. The various classes of outage are further subanalyzed as to cause.

Pulverized Fuel (Prime Movers, No. 148. $1 to non-members). Discussed in this repart are: Direct-fired vs. bin systems, new developments and operating costs of mills and exhausters, Costs of various types of mills for coal furnaces, experience with mill drying, and washing methods. Also included are comments on boiler operation, boiler outages and maintenance, new types of furnace bottoms and experience therewith, burner and furnace performance, and automatic control.

Boilers, Superheaters and Economizers (Prime Movers, No. 156. $1.40 to non-members).

Although there has been no outstanding departure from previously established trends, various refinements indicate a tendency more carefully to balance cost and performance. Several methods of superheat and reheat temperature control are now in use. Attention is called to various things that can be done to safeguard apparatus when first placing in service. Design and operating data of recent boiler installations are tabulated and some interesting operating practices are reported.

Methods and Procedures for Inspection of Materials Used on Overhead Lines (Overhead Systems, No. 150, August, 1931. 75 cents to non-members).

The report does not present standard specifications, but rather indicates common sense interpretations of the more important requirements of such specifications with a view to insuring procedures which should result in obtaining satisfactory line materials.

Derivation and Application of Billing Constants (Meter. No. 146, July, 1931. 30 cents to non-members).

Guide for Specification Covering Metal-Clad Switchgear (Electrical Apparatus, No. 149. 15 cents to non-members)).

Some Features of the Telephone and Telegraph Systems (Foreign Systems Co-ordination, No. 144; July, 1931. 60 cents to non-members).

Telephone Cable Circuit Noise and Power Distribution Systems (Foreign Systems Co-ordination, No. 147; July, 1931. 15 cents to non-members).

Miscellaneous Purchasing and Storeroom Subjects (Purchasing and Storeroom, 51 pages. $1.50 to non-members).

Profusely illustrated by storeroom methods and equipment. Tool control, invoice routine, reclamation, inventory methods, local purchasing plan are featured.

The Effects of Noise Frequency Induction of Grounded Neutral Generators (Foreign Systems Co-ordination, No. 153, August, 1931. 25 cents to non-members).

Men of the Industry

HARRY T. PRICHARD, a vice-president of the Utilities Power & Light Corporation, has been elected a member of the board of directors of the Indianapolis Power & Light Company.

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SAMUEL INSULL, JR., was appointed chairman of a national advisory committee on safety in industry, homes and on streets and highways at the congress of the National Safety Council held recently in Chicago.

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JAMES R. SHELDON, of New York, was elected vice-president of the Beardsley & Wolcott Manufacturing Company, Waterbury, Conn. Mr. Sheldon and FREDERICK W. JUDSON, head of the Waterbury National Bank, have become directors to fill vacancies caused by recent resignations.

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A. F. SOUTHWICK, retired real estate and automobile dealer, has been appointed to the Los Angeles, Calif., Board of Water and Power Commissioners. The appointment, made by John C. Porter, Mayor, has been confirmed by the City Council. Mr. Southwick, regarded as a vigorous exponent of municipal ownership, succeeds A. B. Prior, whose term as a commissioner has expired. The board still is without a successor to O. T. Johnson, Jr., who recently resigned.

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CHARLES R. HARTE of the Connecticut Company has been named chairman of the electrical standards committee, which will centralize the standardization work of the electrical industry under the procedure of the American Standards Association. The new committee, which supersedes the former electrical advisory committee of the A.S.A., will, in addition to the work formerly done by the electrical advisory committee, act in the capacity of the United States national committee of the International Electrotechnical Commission.

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OSCAR MORTON, formerly connected with the Virginia Electric & Power Company, is now associated with the Columbia Gas & Electric Company at Kansas City, Mo. Mr. Morton joined the Virginia utility in 1926, removing to Norfolk from Baton Rouge, La., as assistant to the vice-president at Norfolk, and later he became sales manager for the Norfolk district. Two years ago, when the company undertook to develop promotional rates applicable for major appliances used in the home, as well as revisional rates for other purposes, Mr. Morton's interest in rate structure and rate revision led to his being assigned to assist in the development of these new rates, the work being conducted by Lacombe & Leffler, rate experts. Upon the completion of this work Mr. Morton was made assistant manager of the newly organized insurance department.

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L. B. Round Appointed to New Executive Position

LOUIS B. ROUND, formerly district manager of the Pennsylvania Power Company at New Castle, has been made vice-president and general manager of the

company. General offices of that company have been established in New Castle, which means that the connection with Youngstown, Ohio, is merely nominal. The change marks the promotion of Mr. Castle from the status of a local manager to be the directing head of the company, with which he started in a humble capacity in 1907.

Mr. Round was born in England, but removed to this country at an early age, and he has been a resident of New Castle since 1905. For two years he worked at various tasks, and in 1907 he joined the New Castle Electric Company as a meter reader. Advancing consistently in the ranks, he was appointed assistant superintendent of the Pennsylvania Power Company in Ellwood City, and in 1917, when the New Castle and Ellwood districts were consolidated, he was made assistant superintendent. In 1918 he succeeded J. C. Chestnut as the manager of the New Castle district. Mr. Round's theory of the part the public utility should play in the life of the community—a theory, incidentally, which he put into actual practice—was summed up in this comment made at the time of his new appointment: "It has always been my idea that a public utility is a public servant, that because of its peculiarly intimate relations with the public the company must strive for the confidence of the people it serves, and the only change that I can suggest in the policy of the Pennsylvania Power Company is a more intensive effort to tie up the customer with the company in a cordial, satisfactory relationship."

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RICHARD WERNER, of St. John, N. B., has been appointed appliance manager for the New Brunswick Power Company.

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PAUL DINGLEDY, who has been connected with the Ohio Edison Company, has been appointed assistant to the general manager of the Pennsylvania Power Company, with headquarters in New Castle, Pa.

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C. L. FISH, formerly manager of the Central States Electric Company at La Porte City, Iowa, for more than two years, has been transferred to Northwood in the same capacity. CARL NOLTE of Belmond will take over the La Porte district.

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EVART L. HENDERSON has resigned as general superintendent of the Washington Court House (Ohio) district of the Dayton Power & Light Company to enter the engineering department of the United Gas Public Service Company, with general offices in Houston, Tex.

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FRANK V. BURTON, who resigned last spring as sales manager of the Weber Electric Company, Schenectady, N. Y., and who had previously been for many years general sales manager of the Bryant Electric Company, Bridgeport, Conn., is now sales manager of the Bridgeport Hardware Manufacturing Corporation.

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F. B. STEELE, formerly first vice-president and general manager of the Utica Gas & Electric Company, has become associated with Orrok, Myers & Shoudy, engineers, of New York City. Mr. Steele is planning to make Utica his headquarters. During his connection with the Utica public utility many important and extensive improvements

were carried out, including the Harbor Point steam-hydro-electric plant, extensions to the Washington Street steam plant, also several substations in the Utica territory. Mr. Steele and his associates will carry on a general consulting engineering business, specializing in hydro-electric and mechanical undertakings, together with power plant testing, designing, alterations and reports.

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ROBERTS DEANS, formerly manager for the Illinois Power & Light Corporation at Wood River, Ill., has been transferred to the division office at Belleville, Ill. The vacancy at Wood River has been filled by LEO C. WIESE, who had been connected with the group office at East St. Louis, Ill.

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C. ERIC SUNDHOLM, for eleven years auditor and office manager of the Jamestown (N. Y.) office of the Niagara, Lockport & Ontario Power Company, has resigned. Mr. Sundholm became secretary and treasurer of the Jamestown Lighting & Power Company and treasurer of the Western New York Electric Company in 1920. Later these companies were merged and purchased by the Niagara Power interests and eventually the Jamestown office management took in all of the operations of the power company in Chautauqua County. His plans for the future have not yet been announced.

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WILLITS H. SAWYER has been elected chairman of the executive committee of Iowa Public Service Company, Sioux City Gas & Electric Company and Sioux City Service Company and will devote a portion of his time to active supervision in Iowa of these properties. Mr. Sawyer will continue his New York office at 120 Broadway and also his consultant and sponsorship activities, including his positions as co-receiver of Southern Public Service Company, co-receiver of Carolina-Georgia Service Company and receiver of Springfield Railway Company, Springfield, Ohio.

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C. D. REASOR has been appointed district manager of the electric and gas properties of the Western Power, Light & Telephone Company in Oklahoma and Kansas. Mr. Reasor succeeds FRANK M. GUILD, who for some time has been district manager of the Western Light & Power Corporation in Kansas. Mr. Reasor's headquarters will be in Harper, Kan., and he will have under his direction the field activities of the Western Light & Power Corporation in Kansas and Oklahoma and other non-electric utility companies. L. M. SNYDER has been appointed superintendent of electric and water distribution for the Western Light & Power Corporation.

W. F. Corl Leaves U.G.I.

WILEY F. CORL, vice-president of the United Gas Improvement Company, has resigned to become vice-president of the International Utilities Corporation of New York City. He will serve as chief executive officer of all the public utility subsidiaries of International Utilities. Mr. Corl became identified with U.G.I. when that organization took over the Commonwealth Utilities Corporation, of which Mr. Corl was president. He resigned from this office last year to devote all his attention to U.G.I. interests.

Early in his career Mr. Corl had extensive practical engineering experience, embracing design, construction and

appraisal work, which eminently qualified him for the executive positions which he was later called upon to fill. In 1913 he joined the Southern Illinois Light & Power Company, first as general superintendent; then subsequently became vice-president, and in 1918 he purchased a one-third interest in the Mexico (Mo.) Power Company, becoming secretary and general manager. Then he was made president of the Community Power & Light Company, a holding company with subsidiaries in Kansas, Arkansas, Missouri, Texas and New Mexico. He relinquished these executive duties to devote his time to organizing the Commonwealth Utilities Corporation.

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L. P. BURGESS, formerly vice-president and general manager of the D and B Pump & Supply Company, Los Angeles, manufacturer of oil-well equipment, has been elected president of Metlox Corporation, Ltd., Los Angeles and Manhattan Beach, Calif., manufacturer of neon signs. Mr. Burgess succeeds the late Theodore C. Prouty. WILLIS O. PROUTY has been elected vice-president in charge of manufacturing and sales. Mr. Burgess was closely associated with Theodore C. Prouty for a number of years and is one of the founders of the corporation. Willis O. Prouty, with his brother, Kenneth A. Prouty, has been actively engaged in the management and operation of the business since its inception.

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W. A. BECHTEL, SR., formerly vice-president of the Six Companies, Inc., which holds the contract for the construction of Hoover Dam, has been made president of that company, succeeding the late W. H. Wattis. Mr. Bechtel is president of the W. A. Bechtel Company, one of the member organizations which compose the Six Companies, Inc. E. O. WATTIS, brother of the late president, was elected to succeed Mr. Bechtel as first vice-president, and H. W. MORRISON, vice-president and general manager of the Morrison-Knudsen Company of Boise, Idaho, was chosen to succeed Mr. Wattis as second vice-president. H. J. LAWLER, an executive of the Utah Construction Company, another of the six member companies, and G. L. STEVICK, SR., vice-president of the Fidelity & Deposit Company of Maryland, were elected to the board of directors.

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OBITUARY

ALEXANDER R. HOLLIDAY, for many years president of the old Noblesville (Ind.) Heat, Light & Power Company and secretary of the Kokomo Railway & Light Company, died recently in Indianapolis after a long illness. Mr. Holliday had been identified as an officer or director with many other industrial enterprises. He was born 54 years ago and was a graduate of the Massachusetts Institute of Technology.

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ELIAS MCCLELLAND POSTON, president of the New York Coal Company, Columbus, Ohio, died suddenly at his home in that city October 9. Mr. Poston was one of Ohio's leading industrialists, having engaged since early manhood in the development of the coal, clay and power resources of the Hocking Valley section of that state. A pioneer in the electric industry, Mr. Poston was identified with the very beginnings of the electrical venture in Nelsonville, his native city, which developed into the present Southern Ohio Electric Company, of which his son, J. B. Poston, is vice-president and general manager. Mr. Poston was 69 years of age.

Financial and Statistical News

WHILE showing an unusually wide divergence in ratio of the decline in earnings, most of the larger utilities, especially holding companies, are now reflecting the severity of the depression which affected most other industries earlier. While the majority have held expenses down rigidly, a few show a greater drop in net than in gross earnings. Some companies are still showing advances in earnings.

——UTILITY BOND SALES CONTRACTED AGAIN THIS WEEK with prices receding somewhat along with common stock prices. Average of 37 utility common stocks is now 44.9, against 45.9 last week, a low for the year of 41.2 and a high of 74.

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Commonwealth & Southern Reduces Dividend

COMMONWEALTH & SOUTHERN directors declared a dividend of 15 cents a share on common stock for the six months ending March 1, 1932, payable on that date to holders of record at the close of business February 5, 1932, deeming it wise thus to reduce the current dividend to a rate which is well within the present earnings. The directors declared the regular quarterly dividend of $1.50 per share on its preferred stock $6 series, payable January 2, 1932, to holders of record at the close of business December 4, 1931.

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Consolidated Gas Offer to Subsidiary

ANNOUNCEMENT HAS BEEN MADE by the Consolidated Gas Company of New York of the offer of one share of preferred and one-half share of common stock for each share of preferred stock of the New York & Queens Electric Light & Power Company held by minority interests, and one share of preferred and 2½ shares of common for each common share of the same company owned by minority holders.

This offer resulted from negotiations between a committee composed of G. H. Church, William Carnegie Ewen and Fred W. Gwynne, representing the minority interests, and officials of the company. This policy is in line with the company's plans to eliminate minority interests in subsidiary operating companies in order to facilitate a financial concentration. The committee representing the New York & Queens minority holders has written a letter to stockholders, asserting that it considers the terms of the exchange proposed most advantageous to the minority stockholders. Deposit of virtually all of the minority stock is essential to consummation of the plan.

The Consolidated Gas Company at present owns 420,145 of the 430,000 outstanding common shares of the New York & Queens Electric Light & Power Company, and 9,460 of the 12,500 preferred shares outstanding. Thus, holders of 9,855 common and 3,040 preferred shares are affected by the offer. There are approximately 75 common and 75 preferred holders of New York & Queens stock.

Rate Reductions Bring Increased Consumption

RATE REDUCTIONS BY THE Public Service Company of Northern Illinois over the past year have amounted to a saving for customers, and corresponding decrease in the company's revenues, of more than $1,351,000. This was brought out in the quarterly statement of earnings made public last week and to be inclosed with dividends sent to the company's stockholders on November 1.

A cut in residential electric rates slightly more than a year ago saved customers more than $1,500,000 during the twelve months that followed the reduction. The portion of this amount applying to the quarter just ended was $141,000, according to the quarterly bulletin.

The tendency of these rate reductions, however, is to increase the business of the company. Evidence of this with respect to the last reduction in electric rates is to be found in the 6 per cent increase in consumption.

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Utility Bonds Adapted to Bank Investment

CHARACTERISTICS of the utility industry which make its bonds especially suitable for institutional investment were thus summarized by Matthew S. Sloan, president of the New York Edison Company, in addressing the 38th annual meeting of the Savings Bank Association of New York recently:

"1. It is an unusually stable business.

"2. It is a growing business; growing with population increase; growing with the higher living standards which American ambition always produces; growing with the results of wide and extensive scientific research.

"3. It is a business which makes its product on customers' demands; hence has no problem of surplus goods.

"4. It is a business as free from labor troubles as one can be.

"5. It is a virile, progressive business, willing and able to avail itself of the efficiencies, economies and new sales possibilities which technical study and experimentation and research make possible.

"6. It is a business kept on its toes by the fact that it serves every class and group in our population, in home and place of business. Supplying a necessity of life, it is daily under the keenest critical observation every minute of the 24 hours.

"7. It is a business supervised and regulated by public authority. As such, its rates, its quality of service, its capital issues are under official scrutiny, and it operates with the legal guarantee of a fair return on the value of its investment in property used for public service, if it can earn it. That qualification means much, but at least the utility has legal protection against rates which might be set so low as not to yield a fair return under proper management.

"One further point should be mentioned—the wide distribution of its junior securities, which has a stabilizing effect on the senior securities."

Discussing the ability of utility securities to withstand depression Mr. Sloan said:

"I think no better proof of what I have just said could be produced than the record of utilities during this period of depression. We know only too well what has happened to business in general. We know of factories closed, of

dividends passed or reduced, of working time reduced, of wages cut. There has been little of such conditions in the utility field. I don't say that boastfully. It is a statement of fact. We have had our problems to face. We have had to economize and to dig hard for business. I don't believe there could be a more severe test of the strength and flexibility of a business organization, its inherent soundness and its ability to meet changing conditions than this period has presented. Public utilities as a class have come through it splendidly because the business is what it is. Earnings of some companies have fallen off, but not in any large degree. Earnings of others, perhaps more fortunately situated geographically, or better able to introduce measures of economy or progressive sales methods, have increased despite the bad times.

"Consider, if you please, the showing made by the electric companies of the country in 1930. Their large power sales decreased about 8 per cent. Their sales to homes increased 14 per cent. Sales to offices, stores, theaters and other commercial establishments increased, as did highway and street lighting and other outdoor lighting. Thus the total current sold decreased about 2 per cent compared with the previous year, but the gross revenue increased about 3 per cent. This was because the increases in sales fell into the higher brackets of the rate schedules, whereas large power sales which decreased were in the lowest price ranges."

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Uses Portable Exhibits to Increase Rural Sales

RURAL CUSTOMERS are constantly being added to the networks of the Middle West Utilities System, which cover portions of 31 states. During the first seven months of this year the number of rural customers added was 12.8 per cent greater than in the corresponding period of 1930.

Not only are more rural customers being added, but those who have been customers for some time are using electricity to perform an increasing number of tasks. Sales of electricity to rural customers are 14.2 per cent ahead of last year.

Since the Middle West Utilities System serves primarily small communities, more than 5,000 located in 31 states, it is in a particularly fortunate position to supply the expanding rural market. Operating companies of the system have made use of portable exhibits, model farms and displays at local and state fairs in order to familiarize farmers with the advantages of electricity through the use of various types of appliances now available.

"Bottom Reached," Power Executive Finds

FRANK D. COMERFORD, president of New England Power Association, a division of International Hydro-Electric System, believes the bottom of the depression has been reached. He says:

"Every index of industrial activity in New England indicates that the bottom of the depression was reached some time ago. This does not mean that business is booming now or that old-fashioned prosperity is just around the corner. But we have reason to hope that during the coming winter conditions will be more satisfactory than a year ago.

"New England Power Association serves the most highly industrialized sections of Massachusetts and Rhode Island. The association's business index, based on power sales to the various classifications of industry and adjusted for seasonal variations, shows that the low point was reached last January, when takings were only 77 per cent of an average based on the preceding three years. From that point there was a steady gain until July, when unusual activity in textiles and shoes brought the index to 90. In August there was a falling off to 83, but in September the curve turned upward again and was 85 for the month.

"The four major industries served by our association are textiles, rubber, paper and metals. The textile lows are more than a year in the past; rubber hit its low in November of last year, and paper in January of this year. The metal industries, however, were at a low ebb in the spring and summer of this year and began to turn upward only in August and September.

"In spite of decreased industrial demands, the electric power industry of New England is in a healthy condition, due to the steady increase in domestic consumption. For the first nine months of the year this increase averaged 8½ per cent."

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Canada's Output for August Is Down

CENTRAL-STATION OPERATIONS in Canada continue below the level of recent years. The output during August, reported by the Dominion Bureau of Statistics as 1,251,715,000 kw.-hr., was 11 per cent less this year than last, 13 per cent less than in 1930 and 5 per cent less than in 1928.

The comparison with July is more favorable; it shows a slight increase, whereas in 1930 there was a decrease.

All but 1.4 per cent of the energy was generated from water power. Of this, Quebec produced 644,446,000 kw.-hr. against 710,842,000 kw.-hr. a year ago, Ontario 352,877,000 against 457,424,000, the Prairie Provinces 98,119,000 against 84,925,000, British Columbia 93,900,000 against 96,075,000, and the Maritime Provinces 44,924,000 against 41,778,000. Most of the fuel-generated energy was in the Prairie Provinces, 12,905,000 kw.-hr. against 14,898,000.

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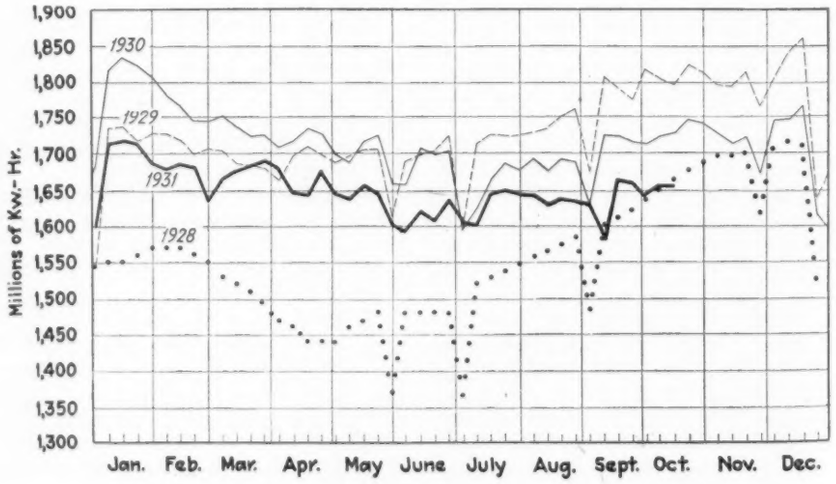
Weekly Energy Output

OUTPUT OF ELECTRIC light and power plants in recent weeks, with comparable figures for other years, is announced by the National Electric Light Association as follows:

	1931	1930	1929	1928
September 19.....	1,663	1,722	1,792	1,614
September 26.....	1,660	1,714	1,778	1,623
October 3.....	1,646	1,711	1,819	1,637
October 10.....	1,653	1,724	1,806	1,651
October 17.....	1,656	1,729	1,799	1,665
October 24.....	1,647	1,747	1,824	1,678

The last three are, in order, 4.1, 4.2 and 5.8 per cent under 1930.



Energy generated weekly for electric light and power

Utility Acts to Relieve Local Unemployment

A SPECIAL STOCKHOLDERS' MEETING was called by the Hartford Electric Light Company to authorize "the expenditure by the company of such sums up to $30,000 as may be required in doing its share as a Hartford corporation toward the relief of local unemployment during the coming winter and to authorize the payment of such sums to the proper officers of the city or the community chest or other appropriate agencies.

"In explantion of this recommended action," the company states, "the special conditions pertaining this year make the assumption of such obligations by corporations absolutely essential to their continued prosperity, as it is obvious that unless relief can be afforded locally, the federal Congress in Washington will do so by instituting a national dole.

"The dole, once in effect as a federal measure, will continue indefinitely and become, as in England, an unbearable burden to both individuals and corporations, whereas if relief is afforded through local subscription, the assessment will cease at the end of the emergency.

"The danger of federal legislation accompanied with burdensome increase of federal taxes is very real and can only be averted by the assurance that suffering will be relieved through local measures.

"The above contemplated expenditure is for unemployment relief over and above the needs of the community chest for the support of local charities. The needs of the latter this year are naturally greater than ever before and require larger and more numerous subscriptions from individuals than in previous years. Consequently, it is essential that corporations shoulder some part of the unemployment relief which this year is added to the need for local charity.

"The officers of your company believe that it is within their power to make the above expenditure in the interest of the stockholders just as they would any other necessary expenditure and they ask for a specific authorization largely for the sake of acquainting the stockholders of the company with the seriousness of the emergency now existing and the imminent danger of federal interference in local problems."

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South West Utility Adds New Industries to Lines

FURTHER INDICATION OF THE Southwest's tendency to become more self-sufficient industrially is a report, issued by James C. Kennedy, president of the Central & South West Utilities Company, showing that a gross of 293 new industries were added to the lines of his company's subsidiaries during the first six months of 1931.

It is estimated that more than 11,000 persons are being employed by the added industries and that the annual kilowatt-hour power consumption of the added industries will be more than 55,000,000. The added annual payroll is estimated at over $16,000,000.

NEWS BRIEFS

The seventh customer-ownership share offering has been successfully completed by the Southern Canada Power Company, Ltd. The official opening of the offering, which had been scheduled to take place on October 12, had to be called off at midnight October 10, inasmuch as reservations by then were already heavily in excess of the number of shares available.

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There have been placed on the Boston Stock Exchange list $1,000,000 of 6 per cent gold debentures of the New England Gas & Electric Association to be dated November 1, 1931, and to mature November 1, 2031.

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New York Stock Exchange has authorized the listing of five-year 5 per cent gold notes of the Pacific Public Service Company to the amount of $8,000,000.

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The Massachusetts Department of Public Utilities has sanctioned a four-for-one-share split-up of the Citizens' Gas, Electric & Power Company, Nantucket, Mass., and a par value reduction from $100 to $25. The outstanding capital stock amounts to $450,000. It is proposed to change the name of the company to the Nantucket Gas & Electric Company.

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Detroit Edison Company will redeem on December 15 all of its ten-year 6 per cent convertible gold debenture bonds, series of 1932, issued and then outstanding.

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CURRENT EARNINGS REPORTS OF ELECTRIC LIGHT AND POWER COMPANIES

Operating Companies

	1931	1930	Per Cent Increase	Operating Ratio 1931	Operating Ratio 1930
Detroit Edison					
(Year ended September 30)					
Gross earnings	$50,541,232	$54,710,285	— 7.6	65	68
Net earnings	17,375,933	17,567,482	— 1.9	..	..
Eastern Texas Electric & Constituent Cos.					
(Year ended August 31)					
Gross earnings	9,604,103	10,208,449	— 5.9	61	59
Net earnings	3,740,160	4,245,743	—11.9	..	..
Gulf States Utilities					
(Year ended August 31)					
Gross earnings	6,598,491	7,107,715	— 7.1	58	55
Net earnings	2,765,805	3,208,845	—13.8	..	..
Louisville Gas & Electric					
(Year ended August 31)					
Gross earnings	10,861,315	10,488,991	3.6	..	..
Net earnings	5,901,524	5,373,543	9.8	..	..
Northern States Power					
(Year ended August 31)					
Gross earnings	33,888,774	33,151,857	2.2	..	..
Net earnings	17,181,360	16,786,552	2.4	..	..
Oklahoma Gas & Electric					
(Year ended August 31)					
Gross earnings	12,706,094	14,791,940	—14.2	..	..
Net earnings	5,980,260	6,960,077	—14.0	..	..
Puget Sound Power & Light & subs.*					
(Year ended August 31)					
Gross earnings	16,318,819	17,108,677	— 4.6	56	57
Net earnings	7,125,269	7,277,003	— 2.1	..	..
San Diego Consolidated Gas & Electric					
(Year ended August 31)					
Gross earnings	7,405,776	7,289,700	1.6	..	..
Net earnings	3,763,736	3,559,996	5.7	..	..
Virginia Electric & Power & subs.					
(Year ended August 31)					
Gross earnings	$17,100,782	$17,184,073	— 0.5	54	55
Net earnings	7,867,386	7,730,146	1.8	..	..
Wisconsin Public Service					
(Year ended August 31)					
Gross earnings	5,597,174	5,619,691	— 0.4	..	..
Net earnings	2,352,836	2,389,861	— 1.6	..	..

Holding Companies

	1931	1930	Per Cent Increase	Operating Ratio 1931	Operating Ratio 1930
American Water Works & Electric & subs.					
(Year ended August 31)					
Gross earnings	$51,642,491	$55,096,974	— 6.3	52	50
Net earnings	24,942,291	27,404,560	— 9.0	..	..
Cities Service					
(Year ended September 30)					
Gross earnings	41,264,823	60,266,054	—31.5	..	..
Net earnings	38,709,382	58,130,187	—33.2	..	..
Federal Light & Traction					
(Year ended August 31)					
Gross earnings	8,256,057	8,510,247	— 3.0	57	57
Net earnings	3,573,876	3,660,187	— 2.4	..	..
Philadelphia Company					
(Year ended August 31)					
Gross earnings	58,703,956	62,677,376	— 6.3	..	..
Net earnings	29,690,863	30,626,737	— 3.1	..	..
Public Service Corporation of New Jersey & subs.*					
(Year ended September 30)					
Gross earnings	138,624,979	138,734,703	— 0.0	67	69
Net earnings	45,537,757	42,734,354	6.5	..	..
Standard Gas & Electric & subs.					
(Year ended August 31)					
Gross earnings	149,690,738	155,277,128	— 3.6	..	..
Net earnings	73,239,064	74,596,894	— 1.8	..	..

* Operating expenses include depreciation.

Business News and Markets

N.E.M.A. Representative on Standards Council

ANNOUNCEMENT HAS BEEN MADE BY the National Electrical Manufacturers' Association of the appointment of H. D. Reed, Bishop Wire & Cable Company, New York City, as its representative on the Standards Council of the American Standards Association and H. A. Calderwood, electrical engineer National Molding Division, Electrical Products Corporation, Pittsburgh, Pa., as alternate for Mr. Reed on the Council. Mr. Reed succeeds R. W. E. Moore of the National Electrical Manufacturers' Association.

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General Electric Sales and Earnings Drop

DETAILS OF THE September 30 report of the General Electric Company, the leading items of which have already been published, follow. The statement shows sales and earnings of the company for the first nine-month periods of the past two years:

	1931	1930
Net sales billed	$206,138,967	$287,886,541
Less cost of sales billed	183,015,401	254,760,876
Net income from sales	$23,123,565	$33,125,664
Other income	9,561,535	11,324,254
Profit available for dividends	$32,685,100	$44,449,918
Less: Cash dividends on special stock	1,931,250	1,931,209
Profit available for dividends on common stock	$30,753,850	$42,518,708

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British Electrical Trade Improves

SO FAR THIS YEAR June has been the best month for electrical equipment orders in the United Kingdom. Actual activity also showed a slight improvement in that month, a small decrease in the total number of electrical workers unemployed being recorded in all branches of the industry.

In power generation as well, the seasonal fall was lighter than usual. Compared with June, 1930, the returns of generation for authorized undertakings show an increase of almost exactly 10 per cent, which, in view of the depressed conditions ruling, is regarded as satisfactory.

Generally speaking, the countries which have hitherto been the chief market for British electrical exports have now reduced their demand to a minimum, while Latin America and Europe have increased their demands and thereby counterbalanced the decline of the old markets.

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National Electrical Code

THE NATIONAL ELECTRICAL CODE, Cl-1931, which was approved as American standard by the American Standards Association in August, has now been published and is available at 5 cents per copy. The code was prepared under the sponsorship of the National Fire Protection Association. It was published by the National Board of Fire Underwriters. Copies may be obtained from the National Fire Protection Association, 60 Batterymarch Street, Boston; from the National Board of Fire Underwriters, 85 John Street, New York, and from the American Standards Association, 29 West 39th Street, New York.

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Johns-Manville Shows Sharp Profit Reduction

THE REPORT OF THE Johns-Manville Corporation and subsidiaries for the quarter ended September 30, 1931, shows net profit of $261,406 after depreciation, depletion, federal taxes, etc. This compares with $715,657 in the preceding quarter and $1,202,867 in the third quarter of the previous year.

Net profit for nine months ended September 30, 1931, was $1,207,174 after charges and taxes, comparing with $2,943,027 in the first nine months of 1930.

Nine months ended September 30:

	1931	1930
Sales	$25,863,353	$38,143,538
Expenses, depreciation, depletion, etc.	24,511,649	34,827,342
Balance	$1,351,704	$3,316,196
Federal taxes	144,530	373,169
Net profit	$1,207,174	$2,943,027

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Westinghouse Shows Larger Third Quarter Profit

NET PROFIT REPORTED by the Westinghouse Electric & Manufacturing Company for the third quarter of the year was $992,632 after depreciation, employees' service annuities, reserves and taxes, etc., against $926,604 in the preceding quarter and a net loss of $2,885,945 for the first quarter of the year.

For the first nine months of 1931 the company reports a net loss of $966,709 after charges and taxes against a net profit of $11,352,244 for the first nine months of 1930. The income account of Westinghouse and proprietary manufacturing companies for the past quarter and the nine months ended September 30 follows:

	Quarter Ended Sept. 30, 1931	Nine Months Ended Sept. 30, 1931
Net sales bill	$27,230,402	$87,853,735
Costs, federal taxes, etc.	26,392,203	89,963,358
Net operating profit	$838,199	*$2,109,623
Other income less miscellaneous charges	154,433	1,142,914
Net profit	$992,632	*$966,709

*Loss.

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DELINQUENT ELECTRICAL ACCOUNTS

(National Electrical Credit Association)

Number of Accounts Reported

Division	September 1930	September 1931	Per Cent Inc. or Dec.	Nine Months 1930	Nine Months 1931	Per Cent Inc. or Dec.
New York	192	161	—16.1	2,619	2,146	—18.0
Middle and Southern Atlantic	126	97	—23.0	1,459	1,079	—26.0
New England	92	100	+ 8.6	1,082	841	—22.2
Central	529	428	—19.0	6,560	5,045	—23.0
Total	939	786	—16.3	11,720	9,111	—22.3

Total Amounts Reported

	September 1930	September 1931	Per Cent Inc. or Dec.	Nine Months 1930	Nine Months 1931	Per Cent Inc. or Dec.
New York	$16,722	$17,388	+ 4.0	$416,182	$276,315	—33.6
Middle and Southern Atlantic	11,232	10,089	—10.2	225,516	137,006	—39.2
New England	6,217	10,654	+71.3	144,901	74,846	—48.3
Central	59,727	40,403	—32.3	856,922	458,481	—46.5
Total	$93,898	$78,534	—16.4	$1,843,521	$946,828	—42.4

Washing Machine Organization Launched

ANNOUNCEMENT has been made to the trade of the formation of Major Appliances, Inc., with offices and plant in Peoria, Ill. R. W. Gorham, formerly general sales manager Altorfer Brothers Company, is president and treasurer. A. J. Hartley of the Hartford Carter Company of Peoria is vice-president and secretary.

A general line of washing machines and ironers will be marketed under the name "Utility." This washer is to be sold C.O.D. only, to save overhead, carrying charges, credit losses and collection expense.

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TRADE BRIEFS

Vaughan Engineers, a well-known Boston consulting organization, has transferred its offices from 44 School Street to 20 Beacon Street, Boston, effective immediately.

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John S. Ware, for the past two years national representative for R. W. Cramer & Company, has been permanently stationed as district representative at Chicago, where he will handle Sauter time-switch activities in several states in the Middle West territory. After being graduated from Columbia University, 1927, Mr. Ware joined the Westinghouse organization, later becoming associated with the Cramer Company.

•

C. B. Coldwell has been transferred to the Fort Worth office of the International-Stacey Corporation.

•

Pennsylvania Pump & Compressor Company, Easton, Pa., has formed a connection with Byer Engineering Associates of the same city.

•

D. Myles Shepard has been elected vice-president of Landers, Frary & Clark, New Britain, Conn.

•

W. J. McDonough has joined the engineering staff of the Northern Equipment Company, Erie, Pa.

•

The Dampney Company of Hyde Park, Boston, Mass., announces the appointment of Clarence J. Hunter to the position of general sales manager with headquarters at Hyde Park. He was formerly manager of the Philadelphia branch office.

•

E. R. Dougherty has joined the sales organization of the American Manganese Steel Company.

Growth in demand for Telechron electric clocks has necessitated a considerable increase in production facilities at the Warren Telechron Company factory at Ashland, Mass.

•

Morison Electrical Supply Company reports for September sales of $133,393, as compared with $145,928 last year, a decrease of 8.5 per cent. Nine months' sales are $1,325,161 compared with $1,334,442 last year, a decrease of $9,281.

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A complete listing of bus connectors and ground fittings compiled for easy reference is announced by Memco Engineering & Manufacturing Company, Inc., Long Island City, N. Y.

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Slight Increase in Electrical Manufacturing

FOR five consecutive months the productive activity in electrical manufacturing plants has not varied more than 1.5 per cent from the mean of that period. The lowest point was reached in August, and was followed by a moderate rise in September, according to reports of energy consumption received by the ELECTRICAL WORLD.

Comparative Index Numbers

	1931	1930
September	129.8	150.0
August	128.0	152.2
July	130.1	148.5
June	130.8	160.2
May	132.0	158.0
Average, nine months	133.9	156.5

The upward movement was contrary to that of 1930 at the same season, but in the same direction as in every other year covered by this series of data. In fact, the upward movement from August to September has generally been much more pronounced.

Compared with September of last year operations are now down 13 per cent, but the low month, March, is exceeded by 4 per cent.

Geographical differences are noticeable. Returns from the Middle Atlantic States are characterized by a general upward movement from August, in some cases very pronounced. New England just as definitely shows a slackening, though the reports from several utilities indicate that the electrical manufacturing groups served by them are much more active than in the early part of the year. In the North Central States the numbers of gains and of losses are about equal, with evidences of weakness in the manufacture of appliances.

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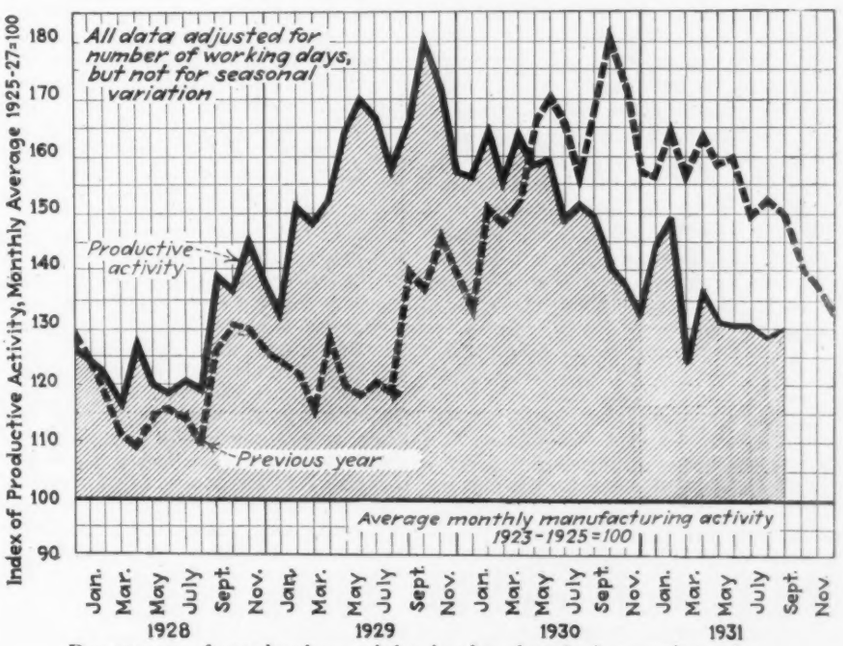
New York Metal Prices Virtually Unchanged

	Oct. 21, 1931 Cents per Pound	Oct. 28, 1931 Cents per Pound
Copper, electrolytic	7	7
Lead, Am. S. & R. price	3.75	4
Antimony	6.50	6.50
Nickel, ingot	35	35
Zinc, spots	3.65	3.58
Tin, Straits	23	23
Aluminum, 99 per cent.	23.30	23.30



Barometer of productive activity in the electrical manufacturing plants of the United States

Market Conditions

EQUIPMENT buying in New England is exceedingly spotty, but totals represent a fair volume, especially in small motors. The Southeast, however, reports a slight increase in the number of orders reported for the week. Industrials are using the present slack period to modernize their equipment.

——METROPOLITAN UTILITIES AND LARGER COMPANIES in general are doing a fair amount of buying in the Eastern district. The tone of business has improved on the Pacific Coast, but buying is still on a hand-to-mouth basis. Railroad buying is at a new low level.

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EASTERN

—A LEADING MANUFACTURER *of electrical equipment in the Eastern district summarizes the immediate situation with the comment that "the larger companies are doing the bulk of buying—smaller interests are decidedly out of the market; indications point to continuance of spotty trade for some time to come."*

—METROPOLITAN UTILITY *companies show up better in the buying aggregate than for several weeks past, with transformers and accessories, wire and cable comprising the majority of commitments. There is a definite upward trend in a number of basic lines of industry and orders for motors, controls and allied equipment are anticipated from that quarter. Electric lighting in its different phases shows some good inquiries and, correspondingly, some sizable contracts.*

A New York power company has placed an order with a state manufacturer for transformers and auxiliary equipment to an amount of $125,000. Another metropolitan utility company has contracted with the same producer for network protectors totaling $35,000. General Cable Corporation has secured a contract from the United States Army Signal Corps, Brooklyn, for a quantity of wire. Westinghouse Electric & Manufacturing Company has been awarded a contract by the Republic Steel Corporation for three 300-hp. adjustable speed motors with control apparatus for service at the Massillon works of the company, totaling $30,000.

Twelve bidders have tendered figures to the Bureau of Yards and Docks, Navy Department, for a lighting installation at the airplane landing field at Miami, Fla., low figure being submitted by William Hepburn & Company, Miami, at $10,130. Department of Commerce, Washington, D. C., will receive bids until November 10 for allied equipment, consisting of a series of rotating beacons, with course lights and accessories, between Wilmington, Del., and Washington. Westinghouse Electric & Manufacturing Company is the successful bidder for lighting equipment for the new Capitol plaza at Washington, D. C., extending from the Capitol to Union Station.

Electric refrigeration continues to score satisfactory business and practically all of the leading manufacturers are running close to capacity. Sparks, Withington Company, Jackson, Mich., prominent in the radio equipment field, is entering the electric refrigerator industry and will give over its entire plant at Michigan Center, Mich., to the new line of output. Electric heater business is moving upward and jobbers report a sizable demand for units to retail at $5 and $6. Electric appliance sales are limited, despite reduced levels for percolators, toasters and similar specialties.

CONSTRUCTION PROJECTS

Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until November 3 for 19,800 ft. of lighting and power cable and 4,900 lb. of weatherproof wire for New York Harbor (Schedule 6788). Signal Supply Officer, Signal Corps, United States Army, Army Base, Brooklyn, N. Y., will receive bids until November 10 for 1,700 mast sections (Circular 41). Armory Board, New York, care of Charles B. Meyers, 31 Union Square, New York, architect, has plans for armory for 104th Field Artillery, at Jamaica, L. I., to cost over $500,000. Board of Education, West Orange, N. J., is asking bids until November 10 for junior high school to cost $550,000. Commissioner of Institutions and Agencies, Trenton, N. J., will receive bids until November 4 for an industrial building at New Jersey Reformatory, Rahway. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until November 10 for one motor-generator set, one panel and spare parts, for Annapolis, Md., navy yard (Schedule 6794); also, at same time, for same yard, for ten d.c. motors (Schedule 6801). General Purchasing Officer, Panama Canal, Washington, D. C., will receive bids until November 10 for switches, fuses, cable, wire, conduit fittings and other electrical supplies (Schedule 2696).

NEW ENGLAND

—SPOTTY BUYING IN *small lots, confined principally to small industrial needs, indicates caution in buying electrical equipment in this district. Small motor sales lead in interest and are placed in single orders in fair volume. Scheduled material sales, according to one manufacturer, are steady, but weekly book accounts show low totals in dollars, with bottom prices prevailing.*

Some specialties are active, including street lighting, and a recent order was noted for 179 special lighting standards with 1,000-watt lamps for an eastern Massachusetts town. One manufacturer is considering orders for special type motors for use in the regulation of heavy-duty valves. Several small turbo-generators for institutional and industrial use are being considered. Slackening in buying equipment for marine needs is reported from shipbuilding plants in this district. Industrial recovery in Maine is reflected in growth of sales of electric merchandise, which for a recent week of this month amounted to over $19,000 and included outstanding placement of washers and irons. During a recent campaign over 160 washers were sold.

CONSTRUCTION PROJECTS

Board of Education, Brookline, Mass., has approved plans for school to cost $400,000. Department of Justice, Boston, Mass., will build court house at East Cambridge, Mass., to cost $200,000. Board of Trustees, Roger Williams University, care of Woodbury & Stuart, 581 Boylston Street, Boston, Mass., architects, has authorized plans for college group at Westerly, R. I., including power house, to cost more than $2,000,000.

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SOUTHWEST

—WHILE THERE HAS *been no radical change in general business conditions, the feeling expressed by manufacturers and jobbers is mildly optimistic.*

Previous reports on merchandise sales have been dark, but one manufacturer says that during the past week by featuring a certain line he sold more than 5,000 of these articles. All report a good number of medium-sized orders. Contracts placed include a radio transmission line for the United States engineering department costing $2,000, a lot of "white-way" poles to cost $2,500 and a switchboard for a small town in Illinois to cost $3,000.

CONSTRUCTION PROJECTS

Bureau of Prisons, Department of Justice, Washington, D. C., will receive bids until November 12 for mechanical and

other buildings for hospital for defective delinquents at Springfield, Mo., including power plant, to cost $2,500,000. Standard Oil Company of Kansas, Neodesha, Kan., will make extensions and improvements in local oil refining plant to cost $200,000. Board of Trustees, State Agricultural and Mechanical College, College Station, Tex., is having plans drawn for an agricultural engineering building, and for petroleum engineering building, each to cost about $200,000.

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PACIFIC COAST

—COMMUNITY CHEST *and unemployment relief response shows a remarkably fine and optimistic spirit and the general business tone is better, although continued hand-to-mouth buying keeps down the volume.*

—HOLIDAY STOCK ORDERS *are largely being placed on the basis of last year's demand, the chief selling items being food mixers, alarm and small chime clocks, portable radios, hand vacuum cleaners and stand size spinner washers.*

Hospital work is very conspicuous in jobs being awarded, including three structures totaling $1,500,000 for San Francisco and about $2,000,000 worth of county hospitals near by. United States government work is featured by bids on the Berkeley post office. Other large jobs in the specification stage include federal buildings, totaling $3,000,000. Railroad buying is unprecedentedly low, being limited to the barest necessities of maintenance, including cables, train wire and dispatcher set parts. Lighting jobs feature a sport track at Belmont, special lighting for railroad service for football feature games, viaduct lighting and especially street lighting. Recent awards covering $20,000 for Los Angeles, $15,500 for South San Francisco and $43,750 for a 136-duplex standard.

Orders during the past week cover $3,000 General Electric generator voltage regulators for a San Joaquin Valley job, an 800-hp. Westinghouse synchronous motor for Hawaiian Islands, $3,000 commercial lighting fixtures for a San Francisco high school, a $9,000 Westinghouse switchboard to control the Hoover Dam gravel plant and two 250-hp. motors for the same.

Failure to receive acceptable bids for a $500,000 light and power bond issue by the city of Tacoma postpones indefinitely placing of wires underground in the downtown districts and doing other betterment work to the municipal system which were contemplated as an aid to the unemployed. Fifteen identical bids for about $30,000 worth of incandescent lamps and six offers for about $5,000 worth of house meters, ranging from 5 to 35 amp. were opened by the Board of Contracts and Awards, Tacoma, on October 26, and contracts are expected to be let shortly.

No apparatus sales were reported last week, but motors ordered were announced as follows: Twelve machines from 50 hp. down to mines in Idaho and Alaska, 30 machines from 50 hp. down to lumber and pulp mills and scattered industrials, 40 machines from 75 hp. down, mainly 25 hp. and under, to industrials, mills and dealers, fourteen from 15 hp. down to dealers and fish canneries and seven machines from 25 hp. down to a sawmill. Awards for about $6,000 worth of cable, redhead beacons, tops, glassware and $2,000 worth of standards for the $5,000,000 George Washington Memorial bridge over the Lake Washington government canal in Seattle will be made within a week, it is stated.

CONSTRUCTION PROJECTS

United States Bureau of Public Roads, San Francisco, Calif., has plans under way for group of nine mechanical buildings at Alameda, Calif., to cost about $800,000. Standard Oil Company of California, Inc., San Francisco, plans development of oil properties in Tampico district, Mexico, with mechanical buildings and oil units to cost over $10,000,000. Board of Education, San Francisco, is having plans drawn for junior high school to cost $600,000. Treasury Department, Washington, D. C., will receive bids until November 18 for post office at Port Angeles, Wash., to cost $190,000.

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SOUTHEAST

—SLIGHTLY BETTER VOLUME *of business, resulting from an increased number of orders rather than the increased size of the individual orders, is reported for the Southeast.*

One power company's creosoted pine pole orders last week aggregated $6,250. The tendency of industrials to take advantage of the dull period to modernize their plants resulted last week in orders from a Tennessee textile for electrical wiring and lighting materials aggregating $10,000 and a Georgia textile ordered similar materials to the extent of $4,000. Another Georgia textile ordered $3,000 worth of electrical materials for use in changing cable and power mains. Three orders were reported from hospitals. A U. S. veterans' hospital in Georgia ordered electrical construction materials amounting to approximately $9,000 and a county hospital in the same state ordered similar material totaling in excess of $3,000. A Tennessee hospital ordered a motor-generator set costing $5,000. Two floodlighting equipment orders amounting to $3,500 each were received from Louisiana and Tennessee towns, while a North Carolina town ordered $2,500 worth of street-lighting equipment.

CONSTRUCTION PROJECTS

Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids until November 3 for one motor-driven air compressor for Hampton Roads, Va., navy yard (Schedule 6757). Owens-Illinois Glass Company, Toledo, Ohio, plans extensions and improvements in plant at Fairmont, W. Va., including installation of electric lehrs and other equipment, to cost over $150,000. Frankfort Industrial Foundation, Frankfort, Ky., plans industrial plant to cost $65,000. State Board of Education, Nashville, Tenn., will build two units at State Agricultural and Industrial College to cost $300,000.

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MIDDLE WEST

—SOME SLIGHT IMPROVEMENT *in general business is observed in this section. While the volume of business has not increased to any appreciable extent, here and there bright spots are appearing that seem to indicate a resumption of activities on a slightly larger scale.*

One of the most encouraging items is the rail and equipment buying of several railroads, one buying 500 gondola cars and 250 hopper cars, while another bought 40,000 tons of rails and 12,000 tons of fastenings. Maintenance and car rebuilding programs are apparently receiving more attention.

Wholesale and retail merchandise trade is somewhat improved, especially in holiday lines. The various utility companies are keeping pace with general conditions, buying for their immediate requirements. Some of the interesting items placed this week include four 2,000-amp., continuous rating, 1,500-volt air circuit breakers, synchronous selector supervisory equipment valued at $7,000 and "Mazda" lamps valued at $150,000.

CONSTRUCTION PROJECTS

Oconto, Wis., plans improvements in plant of Oconto Power & Light Company, recently acquired, including installation of additional equipment, estimated to cost $70,000. Michigan State College, East Lansing, Mich., will build an addition to engineering school to cost over $125,000. Standard Oil Company of Indiana, Chicago, Ill., will carry out expansion and improvement program at oil refinery at Casper, Wyo., to cost over $400,000. United States Engineer Office, Chicago, Ill., will receive bids until November 16 for electrical equipment for locks at Lockport, Marseilles and Starved Rock (Circular 11). Superintendent, Wahpeton Indian School, Wahpeton, N. D., will receive bids until November 3 for one air compressor. State Department of Administration and Finance, St. Paul, Minn., plans extensions in power plant at State Reformatory, St. Cloud, including installation of 200-kw. generator and accessories.

New Equipment Available

Electrode for Welding Within Shielded Arc

INTRODUCTION OF AN IMPROVED, heavily coated electrode for welding within the shielded arc on mild steel has been announced by the Lincoln Electric Company of Cleveland. Like its predecessor, this electrode will be known commercially as "Fleetwood." The new electrode as compared with the old insures a higher ductility of weld metal, 20 to 30 per cent elongation in 2 in. The tensile strength of coupons will be increased about 10 per cent with this electrode to averages between 65,000 lb. and 80,000 lb. per square inch. Resistance to corrosion greater than that of mild steel is also noted. There is little "spattering" with the new electrode. The new "Fleetweld," a shielded arc electrode, requires high welding current and allows increased welding speeds.

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15-Kv. Outdoor-Type Metal-Clad Switchgear

A 15-KV. OUTDOOR-TYPE metal-clad switchgear unit which can be assembled in as many sections as desired has been announced by the Delta-Star Electric Company, Chicago. The drop-type oil circuit breakers are removed with a truck for inspection or adjustments. The current and potential transformers, buses, relays and cable entrances are completely housed in steel inclosures.

The breakers can be solenoid- or motor-operated. All panels and doors are heavily gasketed to prevent entrance moisture.

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OWING TO THE WAY in which the end brackets of the new type N-5 motors are constructed, the Bodine Company announces that they may be provided in vertical or flange-mounted models to meet any specified requirements. Umbrella covers are optional on these installations. These motors are available in ratings of $\frac{1}{16}$ and $\frac{1}{8}$ hp. at 1,725 r.p.m. and $\frac{1}{20}$ and $\frac{1}{12}$ at 1,125 r.p.m.

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A TYPE OF BOILER which provides a solution to the problem of insuring adequate circulation and correct steam liberation under the most severe conditions of operation has been developed by the Combustion Engineering Corporation, New York. Known as the C-E multiple circulation boiler, it departs from the conventional design in two essentials, tube arrangement and steam liberation.

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AN IMPROVED INSULATION MATTING for use as a protection to the operators of power switchboards has been announced by the Diamond Rubber Company, Akron, Ohio. Thicknesses of $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$ and $\frac{3}{8}$ in. are guaranteed to withstand voltages from 20,000 to 45,000 volts, it is claimed.

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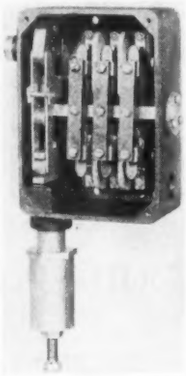
Foot-Operated Snap-Action Plunger-Type Switch

A PLUNGER TYPE, SNAP-ACTION, weatherproof unit switch, bearing the type designation CR-9441-LS443P and designed for general industrial applications, has been announced by the



General Electric Company. It is particularly adapted for foot operation and may be mounted in any position. It has six separate electrical circuits, three normally open and three closed.

The switch has a positive snap action, in either direction, and is operated by a cam and ball mechanism. It is of rugged construction and is adapted for rough-duty installations. The inclosing case is of weatherproof cast-iron construction. An opening in the side of the case permits the connection of a 1-in. conduit. All bearings are made of oil-less bearing material and consequently no lubrication is needed.

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AN ELECTRODEPOSITED SHEET COPPER which is produced in rolls 60 in. wide and in gages down to 0.002 in. has been introduced by the Industrial Development Corporation, Boston, Mass. It has no directional grain structure and its tensile strength and elongation are stated to be uniform when tested either longitudinally or laterally.

Face-Plate Type Speed Regulator

A SPEED REGULATOR of the face-plate type for varying the resistance in the secondary circuit of slip-ring motors has been announced by the Allen-Bradley Company, Milwaukee, Wis. The speed regulator is suitable for motors up to 25 hp. rating and is provided with a face plate of either 25 or 75 amp. rating with an operating handle outside the inclosing cabinet.

Auxiliary contacts are provided for closing a separate magnetic primary switch when the hand lever is in the first-speed position. Disconnection of the motor by any cause makes it necessary to move the lever back to the first position to pick up the primary switch, thereby preventing starting of the motor without all resistance in the three phases. This switch can also be provided with a magnetic primary starting switch and thermal overload relays, all mounted on the panel frame.

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Adjustable-Shaft Motor

AN ADJUSTABLE-SHAFT motor having fine micrometer adjustment has been announced by the Howell Electric Motors Company, Howell, Mich., for the use of pump manufacturers. The adjustment of the shaft is accomplished by cast-steel housing, accurately machined with 16 threads per inch. All adjustments can be made while the motor is in operation, carrying its full load at full capacity. By placing a wrench on the micrometer adjustment, a "gallon-per-minute meter" on the pump and an ammeter on the motor, it can be adjusted to maximum capacity of the pump at maximum efficiency of the motor per horsepower in not more than five minutes, with the motor in operation, the manufacturer states.

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A NEW UNIT PACKAGE, consisting of either an RLM reflector or an angle reflector in a convenient form as one complete unit, which eliminates the necessity of assembling parts from many sources, the cutting of pipe and bending of goosenecks, has been announced by the Benjamin Electric Manufacturing Company, Des Plaines, Ill.

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IN ADDITION TO THE 50,000-kva., interrupting-capacity, triple-pole circuit breakers now made by the General Electric Company, as announced in our October 10 issue, page 672, the company has also placed on the market breakers of 100,000 and 175,000 kva. capacity.